

# ADEA Compendium of Curriculum Guidelines

(Revised Edition)

## **Allied Dental Education Programs**

May 2015–2016

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## INTRODUCTION

This document is a revision of curriculum guidelines that were developed for allied dental education programs between 1984 and 1994 and revised in 2005. It does not include all content areas that could be found in an allied dental education program. Most of the guidelines revised in 2015 are for dental hygiene programs, with a few areas addressing combined dental hygiene and dental assisting programs. However, any of the dental hygiene guidelines could be modified for dental assisting as appropriate for the program and its needs.

The guidelines are intended as a *curriculum development aid*. They are *not* official policy statements of ADEA, nor should they be construed as recommendations for restrictive requirements or a mechanism to standardize allied dental education programs.

While accreditation standards are continually updated, program directors have indicated a need for more specific content guidelines. With an increasing number of new allied dental programs, program directors and allied dental faculty, including many entering an academic career for the first time, there has been an increasing number of requests to re-print and make available the previously developed curriculum guidelines.

In 2014, ADEA began an initiative to revise the 2005 Compendium document and make it available again. Therefore, the Council of Allied Dental Program Directors Administrative Board decided to also revise the previously developed curriculum guidelines.

A call went out soliciting volunteers to review the dental hygiene curriculum guidelines. Thirty-six allied dental educators responded and were formed into nine faculty learning communities (FLCs) representing the major content areas. Of the 36 educators, 11 had participated in the 2005 revision process and returned to share their expertise.

In 2015, eight volunteers from dental assisting education began reviewing the curriculum guidelines. The preclinical and chairside sections for dental assisting were revised along with the development of a new section on expanded duties and dental materials. Teams consisted of two to three dental assisting content specialists for the sections on oral pathology, preclinical/chairside and expanded duties/dental materials. The radiology section was reviewed again for specific content relating to dental assisting education.

The goal of the second revision project was to produce a curriculum guidelines document that would be current and useful, particularly for new developing programs, new faculty and/or other faculty who would be assuming responsibility for a content area that they may not have taught before. Additionally, the

document included educational strategies that address distance/online and blended learning formats.

These guidelines are intended for *entry-level educational programs*, regardless of level (certificate, associate's degree or bachelor's degree) or institutional setting (community college, university, dental school or academic health center). Generally, the guidelines all follow a similar format:

- I. Introduction
- II. Interrelationship
- III. Overview
- IV. Primary Educational Goals
- V. Prerequisites/Concurrent Offerings
- VI. Core Content Outline
- VII. Behavioral Objectives (sample)
- VIII. Sequencing
- IX. Faculty
- X. Facilities
- XI. Occupational Hazards
- XII. Educational Strategies
- XIII. Bibliography/References/Resources\*

- More specific criteria that allied education programs must meet regarding faculty qualifications and facilities can be found in the Commission on Dental Accreditation *Standards* documents for dental hygiene, dental assisting and dental laboratory technology programs.

Chicago: American Dental Association. 2013. At:

[www.ada.org/en/coda/current-accreditation-standards/](http://www.ada.org/en/coda/current-accreditation-standards/)

- In addition, the American Dental Association (ADA) has developed A *Dental Hygiene Guide*, available from the American Dental Association, Council on Dental Education and Licensure, 211 East Chicago Ave., Chicago, IL 60611, and by phone at 312-440-2703.

NOTE: A *Dental Hygiene Guide* is available on the ADA website at:

<http://www.ada.org/en/education-careers/careers-in-dentistry/dental-team-careers/dental-hygienist/dental-hygiene-program-guide>.

The guide was last revised in 2014. It is now provided only in electronic format. Email [dentalcareerguidance@ada.org](mailto:dentalcareerguidance@ada.org) for access.

<http://www.ada.org/en/coda/current-accreditation-standards/>

\*Some content areas list URL addresses. Please be aware that these often change and should be continually checked and updated as necessary. Any texts or journal articles also need to be updated over time.

While the guidelines primarily reflect specific topic content, users of the document should include the appropriate competencies in their own course development and learning strategies. Those competencies, which should be embedded throughout the curriculum, may include but are not limited to:

- Problem-solving.
- Critical thinking.
- Health and safety concepts.
- Regulatory implications and controls.
- Health promotion.
- Ethics and professionalism.
- Interprofessional education (IPE)\*\*.
- Cultural competence/inclusiveness.
- Self-assessment skills.
- Evaluation of current scientific literature.
- Interpersonal and communication skills.
- Evidence-based decision-making.
- Health literacy.
- Global health issues.

Course faculty, regardless of how courses are configured, should use a variety of learning strategies to accomplish program goals and enhance students' abilities to achieve program competencies. These strategies could include but are not limited to case study, problem-based scenarios, computer simulations, web-based and distance technologies and field or community experiences. Common language should be used when referencing the collaborative framework of dental hygiene professionals working with other members of the health care team.

NOTE: The Council of Allied Program Director's Administrative Board has recommended that the *Compendium of Curriculum Guidelines – Allied Dental Education Programs* undergo a five-year review process.

\*\*Operational definition of interprofessional education:

*"When students from two or more professions learn about, from and with each other to enable effective collaboration and improve health outcomes"* (World Health Organization, 2010).

## **ACKNOWLEDGEMENTS**

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## DENTAL HYGIENE CURRICULUM GUIDELINES

### Clinical and Preclinical Dental Hygiene

#### I. Introduction

Clinical dental hygiene is that portion of the dental hygiene curriculum focused on health promotion and disease prevention. Students develop the cognitive, affective and psychomotor skills necessary for delivery of preventive, educational and therapeutic services to the public. Clinical dental hygiene aims to provide comprehensive, evidence-based, patient-centered services that promote optimum oral and systemic health. The delivery of comprehensive care is accomplished through adherence to the process of care: assessment of patient needs, formulation of a dental hygiene diagnosis, planning for the prevention and treatment of oral disease, implementation of various dental hygiene interventions (services) and evaluation and documentation of both the patient and practitioner efforts and oral health outcomes.

#### Definitions

- A. Preventive services: Clinical methods employed by the clinician and/or patient to promote and maintain oral health and optimum systemic health.
- B. Educational services: Strategies developed for an individual or for groups to elicit behaviors directed toward health literacy.
- C. Therapeutic services: Clinical treatment designed to arrest or manage disease and promote the maintenance of optimum oral health.
- D. Process of care: Systematic approach to the delivery of dental hygiene care that supports comprehensive services to meet the individual needs of all patients. The process of care requires defined problem-solving and critical thinking skills and supports evidence-based decision-making.
- E. Dental hygiene diagnosis: A statement of potential or actual patient need that can be addressed by dental hygiene intervention services or strategies.
- F. Preclinic: That portion of clinical education during which the student does not have direct and primary responsibility for providing comprehensive dental hygiene care to a patient. The student performs selected services on a patient, a student partner or a laboratory manikin, but does not necessarily provide a full range of services.
- G. Clinical dental hygiene: The major portion of clinical education. As primary provider, the dental hygiene student uses critical thinking skills to integrate preventive, educational and therapeutic care in treating the patient.
- H. Fundamental clinical dental hygiene skills: Skills routinely performed by the dental hygienist and/or taught to clinical competency in most dental hygiene programs and/or that are legal in most states.

1. Collect data, record and assess a comprehensive health history, including social history.
2. Perform and record extraoral and intraoral examinations, clinical and radiographic assessment of the periodontium and dentition and assessment of occlusion.
3. Assess the need for, expose, develop, evaluate and interpret dental radiographs/images.
4. Expose, assess and transmit intraoral photography.
5. Formulate a dental hygiene diagnosis and supportive dental hygiene treatment plan.
6. Assess, plan, implement and evaluate a dental hygiene treatment plan for the prevention and/or treatment of oral diseases.
7. Assess the need for and perform a periodontal risk assessment, initial and supportive periodontal therapies.
8. Assess the need for and perform therapeutic manual and ultrasonic/sonic periodontal debridement therapies.
9. Perform care and maintenance of procedures for dental implants.
10. Assess the need for and perform extrinsic stain removal procedures.
11. Assess the need for and apply adjunctive topical chemotherapeutic and controlled released agents.
12. Assess the need for and apply pain and anxiety management strategies.
13. Assess the caries risk and plan appropriate interventions and therapies.
14. Assess the need for and application of professional topical fluorides and/or self-applied fluoride.
15. Apply principles of nutritional and/or tobacco cessation counseling to the management of oral and systemic health.
16. Perform recontouring and polishing of existing restorations.
17. Take impressions for, pour and trim study models.
18. Assess the need for and place pit and fissure sealants.
19. Assess, plan and perform patient oral self-care education.
20. Apply standard precautions for the prevention of disease transmission.
21. Follow all state and federal regulatory requirements when rendering patient care.
22. Apply principles of comprehensive record keeping.
23. Apply principles of professional and ethical behavior.
24. Apply principles of evidence-based decision-making.
25. Demonstrate critical thinking and problem-solving skills when providing patient care.

26. Demonstrate professional communication skills in all aspects of patient care that includes interacting with diverse populations and other members of the health care team.
27. Demonstrate concern and understanding of a variety of patient needs based on overall health, oral health, cultural, social and economic circumstances.

I. Additional clinical dental hygiene skills: Those components of care not typically included in the majority of dental hygiene curricula and/or those that, while not currently included in most dental hygiene practice acts, may become the scope of practice for the dental hygienist (appropriate regulatory guidelines must be consulted). Clinical competency in these components of care may be acquired within the dental hygiene curriculum or may require formalized supplemental educational experiences post-graduation.

1. Placing rubber dam.
2. Placing temporary restorations.
3. Placing and removing periodontal dressing.
4. Placing and/or removing sutures.
5. Performing block and infiltration anesthesia.
6. Administering and monitoring nitrous oxide/oxygen analgesia.
7. Performing closed soft tissue curettage.
8. Performing open tissue curettage as co-therapist with the dentist who performs surgical procedures.
9. Removing excess cement.
10. Placing bases and liners into prepared cavities.
11. Condensing and carving amalgam restorations.
12. Placing and finishing composite restorations.
13. Preselecting and removing orthodontic bands.
14. Removing and replacing ligature ties on orthodontic appliances.
15. Fabricating protective mouthguards.
16. Assessing the need for and perform in-office tooth whitening procedures.
17. Performing laser therapy.
18. Performing salivary diagnostics.

## **II. Interrelationship**

Clinical dental hygiene integrates basic, dental and behavioral sciences and is fundamental to the study of dental hygiene. Basic science courses provide vital information on transmission of disease, normal physiologic processes and the disease process in the body systems. The dental/clinical sciences provide information on tooth and periodontal morphology, oral/dental diseases and the restoration

process for oral structures after disease has occurred. The psychosocial and behavioral sciences add much to the understanding of patient motivation and behavior and help the student plan and implement strategies that enhance student–patient interaction.

The design of the clinical curriculum is flexible and may be influenced by the academic setting; however, this should not impact a program's ability to meet its goals, objectives or accreditation standards. Content matter and clinical experiences may be organized as an entity under administration of a single department, as coordinated and sequenced offerings by a number of independent disciplines, or any combination of these options.

### **III. Overview**

The goal of the clinical dental hygiene curriculum is to prepare dental hygiene students with cognitive, psychomotor and affective skills for entry into clinical dental hygiene practice. Content should include principles underlying the components of practice and should facilitate development of a self-directed and self-assessing practitioner. Opportunities for exploring and developing professional ethics, values and attitudes, interpersonal and communication skills, problem-solving capabilities and technical skills should be provided. Clinical experiences should have avenues for students to achieve competency in the above, while providing care to patients of various medical conditions, age levels and social and cultural backgrounds and with a range of preventive and therapeutic oral health needs. To ensure integration and coordination of skill development, the clinical portion should extend throughout the entire dental hygiene curriculum. Opportunities for extramural, public health or community-based experiences should be provided to increase student exposure to a more diverse population in preparation for the evolving oral health needs of society.

### **IV. Primary Educational Goals**

Clinical dental hygiene experience provides preventive and therapeutic care according to the process of care: assessment, dental hygiene diagnosis, planning, implementation, evaluation and documentation (including electronic health records).

This requires critical thinking and evidence-based decision-making skills that guide the provision of dental hygiene care within a focused scope of practice.

Upon the completion of the clinical curriculum, the student will be able to:

- A. Apply the process of care to preventive and therapeutic oral health management to a diverse patient population.
- B. Assess and analyze objective and subjective patient findings to formulate an evidenced-based, patient-centered dental hygiene diagnosis.
- C. Plan, implement and evaluate intervention strategies that will promote and maintain oral health and overall health including oral self-care behaviors.
- D. Demonstrate knowledge of and skill in applying dental hygiene methodology of care.
- E. Apply the principles of professional and ethical behavior in providing care to individuals of all populations.

#### **V. Prerequisites**

Although prerequisites for program entry will vary according to the educational setting, they should provide a foundation for the study of basic, behavioral and clinical sciences.

#### **VI. Core Content**

The following are major subject areas that may be included in the curriculum. Specific sequencing should reflect each program's educational philosophy and goals. Content areas are not identified as essential or nonessential because the scope of dental hygiene practice will reflect the different state practice act regulations.

- A. Prevention of disease transmission.
- B. Patient/operator positioning.
- C. Time and motion management.
- D. Prevention and/or management of emergency situations.
- E. Comprehensive patient assessment.
- F. Diagnosis and planning of dental hygiene care.
- G. Principles and methods of dental hygiene intervention.
- H. Cotherapy modalities supporting delivery of services typically initiated or completed by the dentist.
- I. Principles and methods of evaluating outcomes of dental hygiene care.
- J. Monitoring and record keeping.
- K. Professional ethics, life-long learning and leadership.

**VII. Behavioral Objectives**

Upon completion of the dental hygiene curriculum, the student will be competent in:

**A. Prevention of disease transmission.**

- i. Asepsis protocol of recommended clinical guidelines for infection and hazard management prior, during and after the provision of dental hygiene services.
- ii. Management of individuals with bloodborne infectious diseases based on standard precautions.
- iii. Post-exposure guidelines as defined by the Centers for Disease Control and Prevention (CDC).
- iv. Selection and use of effective methods of instrument and dental unit sterilization/disinfection.
- v. Valuing the dental hygienist's role in preventing disease transmission.

**B. Patient/operator positioning.**

- i. Positioning self and the patient to maximize accessibility and visibility to the field of operation.
- ii. Selecting operator positioning strategies to prevent or lessen the risk of injury to self and/or the patient during implementation of dental hygiene care.
- iii. Valuing the need for effective ergonomics and safe patient/operator positioning.
- iv. Valuing the need for effective use of vision magnification for intraoral procedures.

**C. Time and motion management.**

- i. Selecting time and motion patterns for safe and efficient implementation of dental hygiene care.
- ii. Valuing the need for efficient time and motion management.

**D. Prevention and/or management of emergency situations.**

- i. Developing a management plan for medical emergencies.
- ii. Applying current methods for prevention of emergencies.
- iii. Assessing the patient's need for emergency care.
- iv. Implementing basic life support methods consistent with American Heart Association guidelines.
- v. Valuing maintaining skills in preventing and managing emergencies.
- vi. Valuing the dental hygienist's role in preventing and managing emergencies.

E. Comprehensive patient assessment.

1. Obtaining and recording a comprehensive medical, social, dental and nutrition health history.
2. Recognizing conditions that necessitate special consideration prior to or during treatment.
3. Obtaining, interpreting and monitoring vital signs according to American Heart Association guidelines.
4. Performing and documenting an extraoral and intraoral examination that includes soft and hard tissue of the head, neck and oral cavity.
5. Performing and documenting an examination of the dentition that includes dental charting, occlusion and assessment of hard and soft deposits.
6. Performing and documenting an examination of the periodontium that includes gingival assessment, recession, bleeding upon probing, sulci and/or pocket measurements, clinical attachment level, furcation involvement, tooth mobility, fremitus, mucogingival conditions and radiographic findings.
7. Evaluating patient risk factors for oral diseases.
8. Discriminating pertinent and significant assessment findings from those that are not significant or within a range of normal.
9. Assessing the need for exposing intraoral and/or extraoral radiographs/images to support the clinical examination.
10. Exposing, developing, interpreting and evaluating intraoral and extraoral dental radiographs/images.
11. Assessing the need for exposing, developing and implementing intraoral photography.
12. Employing radiation safety principles in procedures requiring exposure to ionizing radiation.
13. Using supplemental screening tools to support assessment strategies such as Periodontal Screening and Recording (PSR), alginate impressions and study models, indices and vitality testing.
14. Assessing for the patient's oral health needs, beliefs, knowledge, skills and self-care practices.
15. Valuing the need for consistently performing patient assessment at professionally accepted standards of care.

F. Diagnosis and planning of dental hygiene care.

- i. Analyzing the patient's needs for preventive, educational, and therapeutic dental hygiene services.
- ii. Synthesizing patient assessment findings and risk factors in formulating a patient-centered dental hygiene treatment plan and case presentation.
- iii. Formulating a dental hygiene diagnosis from comprehensive assessment findings or evidence.
- iv. Proposing measurable patient outcome goals for oral health.
- v. Identifying factors contributing to the patient's preventive, educational and/or therapeutic oral health needs.
- vi. Selecting dental hygiene intervention strategies that will guide the patient to achieving patient-centered oral health outcomes that include oral and systemic health education strategies.
- vii. Appointment planning and sequencing of dental hygiene care to meet the patient's oral health goals.
- viii. Obtaining informed consent by discussing with the patient his/her oral health findings, goals and treatment strategies.
- ix. Value the importance of patient-centered care and concepts of health promotion.

G. Principles and methods of dental hygiene intervention.

- i. Implementing dental hygiene strategies and services that address the factors contributing to the patient's preventive, educational and/or therapeutic oral health needs.
- ii. Implementing cognitive, psychomotor and affective strategies to manage barriers to oral self-care.
- iii. Performing nutritional and tobacco cessation counseling for oral health management.
- iv. Performing initial and supportive periodontal therapies.
- v. Implementing nonsurgical therapeutic periodontal debridement procedures supportive of the patient's oral health condition.
- vi. Applying the principles of instrumentation that include grasp, fulcrum, adaptation, angulation, activation/stroke and lateral pressure to assure complete debridement.
- vii. Applying the principles of instrument design that include shank, handle, working end/blade to support instrument selection for maximum effectiveness, safety and efficiency in debridement procedures.
- viii. Applying principles of therapeutic ultrasonic periodontal debridement.
- ix. Maintaining instrument sharpness.



- x. Using pain and anxiety management strategies that include applying topical anesthetics, applying hard tissue topical desensitizing agents, administering or assisting in the administration of block and infiltration anesthesia and administering or monitoring of nitrous oxide/oxygen analgesia.
  - xi. Applying preventive and therapeutic topical agents for disease management, including fluoride, antimicrobial agents and local delivery/controlled released agents.
  - xii. Applying selective coronal polishing procedures that include polishing, air-powder polishing and selection of polishing agent.
  - xiii. Performing and evaluating the placement of pit and fissure sealants.
  - xiv. Performing and evaluating the finishing and polishing of existing restorations.
  - xv. Valuing the need for consistently performing preventive, educational and/or therapeutic dental hygiene services at professionally accepted standards of care.
- H. Cotherapy modalities supporting delivery of services that may involve the dentist or other members of the dental team.
- i. Placing rubber dams.
  - ii. Placing temporary restorations.
  - iii. Placing and removing periodontal dressing.
  - iv. Removing sutures.
  - v. Performing closed soft tissue curettage.
  - vi. Performing open tissue curettage as co-therapist with the dentist who performs surgical procedures.
  - vii. Removing excess cement.
  - viii. Placing bases and liners into prepared cavities.
  - ix. Condensing and carving amalgam restorations.
  - x. Placing and finishing composite restorations.
  - xi. Preselecting and removing orthodontic bands.
  - xii. Removing and replacing ligature ties on orthodontic appliances.
  - xiii. Fabricating protective mouth guards and custom trays for fluoride and whitening application.
- I. Principles and methods of evaluating outcomes of dental hygiene care.
- i. Evaluating and documenting the results of preventive and/or therapeutic dental hygiene interventions in meeting the proposed treatment plan goals.

- ii. Recommending a recare schedule for continued supportive care.
- iii. Recommending referral for additional assessment and/or treatment.
- iv. Valuing the importance of evaluation in monitoring patient oral health.
- v. Assessing overall patient satisfaction with care provided.

J. Health informatics and emerging technologies.

- i. Applying the principles for maintaining comprehensive and accurate records of all information and services offered to and provided to the patient.
- ii. Documenting additional dental care needed by the patient.
- iii. Valuing the need for maintenance of thorough and accurate records.

K. Professional ethics.

- i. Applying the principles of professional and ethical behavior when providing patient care.
- ii. Self-assessing ability to perform dental hygiene services at a high standard of care.
- iii. Valuing patient confidentiality and patient rights according to the guidelines of the Health Insurance Portability and Accountability Act of 1996 (HIPAA).
- iv. Valuing the patient's right to dental hygiene care consistently provided at acceptable standards.

**VIII. Sequencing**

The clinical dental hygiene curriculum should extend throughout the entire program of study. The preclinical component, along with basic, dental and behavioral science topics, should provide students with the prerequisites for the clinical component of the curriculum. In order to provide the skills and knowledge required for attaining competency in clinical dental hygiene practice, attention should be given to the sequencing of material, assessment methods and student outcomes.

**IX. Faculty**

Faculty should have sufficient knowledge and experience with current standards of dental hygiene practice, the appropriate level of education and a background in educational methods, testing and

measurement, and evaluation. Support, participation and integration of the basic and dental science faculty should be encouraged.

#### **X. Facilities**

Clinical facilities and equipment should provide students the opportunity to achieve the clinical curriculum's objectives and allow for a level of practice at current standards of care.

#### **XI. Occupational Hazards**

The clinical component should provide a safe working environment for the staff, students and patients. Educational policies and procedures should support the CDC and Occupational Safety and Health Administration (OSHA) guidelines for management of infectious materials. Faculty, staff and students should be knowledgeable of and value individual rights to confidentiality according to HIPAA guidelines.

#### **XII. Educational Strategies**

According to the Commission on Dental Accreditation (CODA) dental hygiene standards, "faculty should have current background in education theory and practice, concepts relative to the specific topics they are teaching, clinical practice experience and, if applicable, distance education techniques and delivery" (1)\*. Educational methods for an online or hybrid environment should be included to assure student engagement and appropriate role responses during a medical emergency in the dental setting. Student engagement activities may include:

- Role play of medical emergencies.
- Development of case studies related to dental hygiene patient care.
- Interprofessional activities between dental hygiene and other health science.
- Students.
- Interactive discussion boards, either synchronous or asynchronous.
- Communication activities to include other health care professionals.

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4. U.S. Department of Health and Human Services, Health Resources and Services Administration. Transforming Dental Hygiene Education Proud Past, Unlimited Future: Proceedings of a Symposium. 2013. At: <http://www.hrsa.gov/publichealth/clinical/oralhealth/transformingdentalhygiene.pdf>. Accessed 8 Nov. 2014.

### **Professional Organizations – Current Evidence-based Policies and Educational Resources**

- American Academy of Pediatric Dentistry.
- American Academy of Periodontology.
- American Dental Association.
- American Dental Education Association.
- American Dental Hygienists' Association.
- Center for Evidence-based Dentistry.
- National Center for Interprofessional Practice and Education.
- National Dental Practice-Based Research Network.
- U.S. Department of Health and Human Services Cultural Competency Program for Oral Health Professionals.

### **Online Dental Journals**

- *Dental Clinics of North America.*
- *Journal of the American Dental Association.*
- *Journal of Dental Hygiene.*
- *Journal of Dental Education.*
- *Journal of Dental Research.*
- *Journal of Evidence-Based Dental Practice.*
- *Journal of Periodontology.*
- *Journal of Public Health Dentistry.*
- *Periodontology 2000.*

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- Elsevier Evolve.
- LWW thePoint.

### **Oral Health Education Websites**

- [MouthHealthy.org](http://MouthHealthy.org).

### Continuing Education Websites

- Colgate Oral Health Network:  
<http://www.colgateoralhealthnetwork.com>.
- [Dentalcare.com](http://www.dentalcare.com) (P&G).

### Dental Corporation Educational Websites

- Colgate Professional:  
<http://www.colgateprofessional.com/>.
- GlaxoSmithKline Dental Professional:  
<http://www.dental-professional.com/>.
- J&J Professional:  
<http://www.listerineprofessional.com/>.
- Philips Professional:  
<http://www.sonicare.com/professional>.
- P&G/Oral B Professional:  
<http://www.dentalcare.com/en-US/oral-b-crest-professional-products/oral-b-crest-professional-products.aspx>.
- Waterpik Professional:  
<https://www.waterpik.com/oral-health/pro/>.

## **Community Dental Health**

### **I. Introduction**

Community dental health is that portion of the dental hygiene curriculum that prepares students to promote oral health and prevent oral disease in a community. It provides students with a broad understanding of the dental care delivery system and an objective view of the significant social, political, psychological, cultural and economic forces directing the system. The approach taken within the course provides students with the knowledge and skills necessary to meet specific oral health needs of community groups as distinct from the traditional clinical approach designed to meet the needs of individual patients. Additionally, the course exposes the students to the community-based role of the dental hygienist by allowing them to manage access to care issues within underserved populations.

#### **Definitions**

- A. Community: A group of people who live in one area and have common interests.
- B. Community dental health or dental public health: The science and art of preventing and controlling oral disease and promoting oral health through organized community efforts. Dental public health encompasses dental care and education, with an emphasis on the use of the dental hygiene sciences, delivered to a population.
- C. Target population: A representation of a certain segment of the population.

### **II. Interrelationships**

The community dental health curriculum is closely associated with the disciplines of psychology, sociology, communications, education and epidemiology. Specific components of the curriculum, including oral health education, government involvement in dental care delivery, needs of special population groups, principles of health promotion, preventive modalities and clinical skills, are applied within the context of the course. Knowledge and skills learned in basic and behavioral sciences are incorporated and reinforced during various parts of the curriculum.

### **III. Overview**

Community dental health is concerned with the knowledge, attitudes, skills and behaviors necessary to promote oral health and prevent oral disease through organized community-based efforts. The content of such programming must provide accurate and evidenced-based information and

promote only those practices that reliable research data have shown to be effective and safe.

An organized approach to community-based programming includes: assessment of the community's needs, dental hygiene diagnosis, planning (setting priorities, goals, objectives and educational strategies) to meet those needs through promotion of health and prevention and treatment of disease, implementation of this planned program and, lastly, evaluation of the program and program outcomes from the perspectives of the community and the dental professional.

#### **IV. Primary Educational Goals**

Upon completion of the curriculum, the student will be able to:

- A. Explain the historical evolution of dental hygiene as a dental public health science.
- B. Define the roles of the dental hygienist within a community setting, as a member of health care teams and within collaborative frameworks.
- C. Describe characteristics of the current dental care delivery systems operating in the United States and international communities; discuss the social, political, psychological, cultural and economic factors that affect utilization of the system; and trends that may influence the delivery system in the future.
- D. Critique the major issues influencing the current mode of dental care delivery.
  1. Health literacy and health equity.
  2. Need for language interpreters and translation services.
- E. Evaluate knowledge and skills in each of the following subject areas as they relate to community-based needs:
  1. Oral epidemiology and research methodologies.
  2. Oral health education and promotion.
  3. Government influence on the dental care delivery system.
  4. Prevention, control and treatment of oral diseases.
  5. Program planning and evaluation.
- F. Compare the effectiveness, efficiency, practicality and economic feasibility of preventive measures when applied to community-based dental programs.
- G. Identify the needs of a target population group by gathering and analyzing appropriate assessment data.
- H. Assess, diagnose, plan, implement and evaluate a community-based program.
- I. Formulate channels of communication to promote interprofessional community collaboration.

## V. Prerequisites

Students should have knowledge of psychology, sociology and communication to achieve a basic understanding of human behavior and the impact of societal beliefs, values and organizational systems on health care delivery. A foundation in basic and behavioral sciences will assist the student in comprehending the nature of health care needs and in performing problem-solving activities relevant to community oral health. Knowledge of effective methods of oral disease prevention, health promotion and education, patient management and adaptation of programs for patients with special health care needs is useful. Oral and written communication skills using plain language and assurance of compliance with the Americans with Disabilities Act for culturally diverse populations are important. Understanding of health literacy is crucial for patient communication.

## VI. Core Content Outline

The curriculum should include didactic and community field experiences. Extramural experiences are vital to this curriculum content, as they provide more authentic service learning. Some areas of the curriculum will be contingent on the community resources available to the program. The following areas should be included:

- A. The role of the dental public health professional in the prevention and control of oral diseases and promotion of optimum health.
  - 1. Historical development of dental public health.  
See: <http://www.usphs.gov/aboutus/history.aspx>.
  - 2. Prevention and control of oral diseases and conditions.  
See: <http://www.cdc.gov/>.
  - 3. Community oral health education and promotion.
- B. Epidemiological patterns of oral diseases and epidemiological methods of investigation.
  - 1. Methodologies used in oral health research.
  - 2. Biostatistics in oral health research.
  - 3. Epidemiological reports such as:
    - a. Healthy People 2020:  
(<https://www.healthypeople.gov/>).
    - b. Oral Health in America: A Report of the Surgeon (2000)  
(<http://www.surgeongeneral.gov/library/reports/index.htm>).
    - c. Surgeon General's National Call to Action (2003)
    - d. National and State-Level Projections of Dentists and Dental Hygienists in the U.S., 2012-2025
- C. Basic principles of research methodology and biostatistics, including application of this knowledge to evaluate literature provided by various sources and applied to evidence-based dental hygiene practice.



1. The Community Guide: Community Preventive Services Task Force  
(<http://www.thecommunityguide.org/about/task-force-members.html>).

- D. Governmental influences in the dental care delivery system.
  1. Dental care need, demand, supply and use and the factors that influence them.
  2. Provision and financing of private and public dental care programs.
  3. Dental care delivery in global communities.
  4. Affordable Care Act (and/or other relevant legislation).
- F. Approaches to community program planning and evaluation.

## VII. Behavioral Objectives

At the completion of the curriculum, the dental hygiene student should be able to:

1. Explain the history of dental hygiene in relation to dental public health.
2. Define community dental health/dental public health.
3. Define the range of personal, social, economic and environmental factors that influence health status, i.e., determinants of health.
4. Identify and use the current practiced public health preventive modalities.
5. Defend the need for preventive modalities in dental public health practice.
6. Identify appropriate levels of supplemental fluoride for a community.
7. Describe the history and of community water fluoridation.
8. Identify and use community dental health activities related to prevention and control of oral conditions and promotion of health.
9. Explain the role of dental providers, with emphasis on the dental hygienist, in activities related to the practice of public health.
10. Describe the state of oral health in the United States.
11. Describe the dental care delivery system in the United States
12. List the government departments and agencies related to oral health and dental hygiene.
13. Compare the federal, state/provincial and local presence of government in dental care delivery.
14. Evaluate the dental hygienist employment opportunity ratio.
15. Describe dental labor force use of and access to dental care.
16. Analyze need, supply, demand and use of dental care as it pertains to utilization.
17. Critique current methods of payment for dental care.
18. Define and apply terminology associated with financing dental care.

19. List the different insurance coverage options available for dental care.
20. Evaluate the role of the government in financing dental care.
21. Describe the demographics, educational preparation and regulation of dental hygienists in other countries.
22. Compare dental public health programs in other countries.
23. List and define the international professional organizations involving dental public health.
24. Discuss the regulation of dental hygienists in other countries.
25. Summarize the legislative process.
26. Identify the major bodies of law.
27. Describe the rules and regulation of the dental hygiene scope of practice.
28. Advocate the use of a dental hygienist without restrictive barriers in scope of practice.
29. Describe the responsibilities of dental hygienists in the United States.
30. Define oral health in relation to health education and promotion.
31. Describe health education and promotion principles.
32. Outline the different learning and motivation theories.
33. Describe how a dental hygienist could best educate a target population.
34. Describe the process of lesson plan development.
35. List and describe teaching strategies.
36. List the characteristics of an effective teacher.
37. Develop and present a lesson plan on oral health education.
38. Identify target populations to whom dental hygienists may provide services.
39. Describe cultural diversity.
40. Describe the effect culture has on oral health and dental hygiene care.
41. List barriers to obtaining and delivering dental hygiene care.
42. Describe the various program planning paradigms
43. Describe various dental public health programs.
44. Develop a dental public health program plan.
45. Perform a needs assessment of the target population.
46. Plan a community program based on the needs assessment.
47. Identify possible constraints, alternatives and evaluation tools for the program.
48. Plan an evaluation for the community program.
49. Describe the mechanisms of program evaluation.
50. Compare qualitative and quantitative evaluation.
51. Describe and define the goals of various dental indices.
52. Define oral epidemiology and related terms.
53. Describe current epidemiological trends of oral conditions and diseases.
54. Identify the role of host, agent and environment in the disease process.
55. List and describe the publications reporting oral epidemiology and use appropriate information resources in community dental health.
56. Describe oral epidemiology and its relationship to dental hygiene.

57. Describe the current epidemiological issues of disease.
58. Describe the reasons for conducting research in dental hygiene.
59. Define the purpose of dental hygiene research.
60. List, explain and describe the various research approaches appropriate in community dental health.
61. Define and describe data analysis and interpretation techniques used in community dental health literature.
62. Identify data by their type and scale of measurement.
63. Define and describe descriptive and inferential statistics.
64. Select and compute appropriate measures of central tendency and measures of dispersion.
65. Describe and construct frequency distributions and graphs.
66. Describe the evolution of dental care product production.
67. Defend the dental hygienist's role in advocating the use of effective dental care products and treatment modalities.
68. Educate the public in dental care product evaluation.
69. Effectively critique oral health research reported in dental publications.
70. Describe dental public health careers.
71. Describe various government-related opportunities for dental public health programs.
72. Define dental hygiene positions in the areas of public health and government.

### **VIII. Competencies**

After taking the community/public dental health course, the dental hygiene student should be competent in the following:

1. Providing health education and preventive counseling to a variety of population groups.
2. Promoting the values of good oral and general health and wellness to the public and organizations within and outside the professions.
3. Identifying services that promote oral health and prevent oral disease and related conditions.
4. Advocating for consumer groups, businesses and government agencies to support health care issues.
5. Assessing, planning, implementing and evaluating community-based oral health programs.
6. Using screening, referral and education to bring consumers into the health care delivery system.
7. Providing dental hygiene services in a variety of settings, including offices, hospitals, clinics, extended care facilities, community programs and schools.
8. Employing current infection prevention and control resources in community-focused health care settings.

9. Evaluating reimbursement mechanisms and their impact on the patient's access to dental care.
10. Recognizing and using written and electronic sources of information.
11. Evaluating the credibility and potential hazards of dental products and techniques.
12. Evaluating published clinical and basic science research and integrating this information to improve the oral health of the patient.
13. Recognizing the responsibility and demonstrating the ability to communicate professional knowledge verbally and in writing.
14. Accepting responsibility for solving problems and making decisions based on accepted scientific principles.
15. Expanding and contributing to the knowledge base of dental hygiene.

## **IX. Sequencing**

The didactic portion of the curriculum should follow psychology, sociology, speech/communication and basic required dental hygiene courses. A field experience used to enhance the didactic portion should be planned concurrently with or following the didactic material.

## **X. Faculty**

A faculty member should be designated as the course instructor responsible for organizing the didactic portion of the course and coordinating community-based experiences. For this portion, the dental hygiene faculty member must have background in and current knowledge of public health and community dental education and educational methods, testing and evaluation. Dental public health providers and other interdisciplinary professionals could be involved as guest speakers and field experience contacts.

## **XI. Facilities**

Identification of target groups and facilities for community-based experience activities is useful. The cooperation of a variety of health care agencies and public health professionals should be sought in support of the curriculum.

## **XII. Educational Strategies**

The community dental health curriculum requires the learner to integrate critical thinking and problem-solving skills and evidence-based decision-making throughout the curriculum sequence. Various education methods can be used to address the cognitive, affective and psychomotor domains to effectively transfer meaning to the learner. General educational methods other than lectures could include the use of case study, role play, team

projects, panel or group discussion, debate and interviews. The following list of methods and examples involve individual and group learning.

Content-specific learning activities include:

1. Diversity: Students spotlight a given culture and indicate to peers empathic actions for addressing population differences.
2. Identifying stakeholders: Using target rings, place an at-risk population in the bull's-eye. For each surrounding ring, identify: Who are persons or organizations that have an interest in the health/oral health of the target population? (Ring 1); Where do these stakeholders come in contact with the target population? (Ring 2); What can a partnership with stakeholders do to help promote the oral health of the target population? (Ring 3); Who are the relevant local groups or organizations? (Ring 4).
3. Program planning: Using a logic model to organize program planning, students identify an at-risk population priority, corresponding Healthy People 2020 objective, behavior and knowledge outcomes, activities and partners, resources, assumptions and extraneous variables.
4. Sampling populations: Using M&M's®, students demonstrate sampling techniques (random, stratified random, systematic and convenience).
5. Evaluation methods: Compare qualitative and quantitative methods. A qualitative example is comparing the taste descriptions of different brands of apple juice. As a quantitative example, students design a 10-question test to administer to a population and conduct pre- and post-test analyses using t-test statistics.

Learning assessment activities include:

1. Assessing prior knowledge, recall and understanding.
  - a. Open-ended questions/answers – Use to determine the most effective starting point for lectures/activities. Class activity.
  - b. Misconception/Preconception Check – Identify information that can be a barrier or interfere with the new knowledge presented in the curriculum. Individual activity.
  - c. Memory Matrix – Use self-reflection recall of weekly presented material in lieu of a quiz to assess learner ability to recall and organize learned content. Individual activity.
2. Assessing skill in analysis and critical thinking.
  - a. Pro and Con Grid – List a quick overview of pros, cons, costs, benefits, advantages or disadvantages of a learning concept. Small group activity or split-class activity.
  - b. Content, Form and Function Outlines – Display columns to help learners determine the content (what?), form (how?)

- and function (why?) of a communicative function of a piece of writing film, video or class presentation. Individual activity.
3. Assessing skill in synthesis and creative thinking.
    - a. Concept Maps – Ask learners to visually organize a given focus concept to assess how the learner makes connections and associations in learning. Individual activity.
  4. Assessing skill in problem-solving.
    - a. Problem Recognition Tasks – Ask learners to recognize and identify the particular type of problem within an example and present it to the class. Individual or small group activity.
    - b. Audio and Videotaped Protocols – Although time consuming, this provides a comprehensive illustration of what a learner would do given a case scenario, demonstrating the learner's self-awareness and thinking. Individual or peer assessment activity.
  5. Assessing students' awareness of their attitudes and values.
    - a. Double-entry Journals – Use to enhance knowledge uptake when reading textbooks. Student journal entries indicate the ideas, assertions and arguments in the assigned readings on one side of a journal and indicate the personal significance of the passage on the other side. Individual activity.
    - b. Everyday Ethical Dilemmas – Students identify, clarify and connect their values by responding to course-related issues and problems they are likely to encounter. Individual activity.

Resource: Angelo TA, Cross KP. Classroom assessment techniques. 2<sup>nd</sup> ed. San Francisco: Jossey & Bass, 1993.

### XIII. Bibliography

1. Burt BA, Eklund SA. Dentistry, dental practice and the community. 6<sup>th</sup> ed. Philadelphia: WB Saunders, 2005.
2. Gagliardi L. Dental health education. 2<sup>nd</sup> ed. Upper Saddle River, NJ: Prentice Hall, 2007.
3. Geurink KV. Community oral health practice for the dental hygienist. 2<sup>nd</sup> ed. Philadelphia: WB Saunders, 2005.
4. Gluck GM, Morganstein WM. Jong's community dental health. 5<sup>th</sup> ed. St. Louis: Mosby, 2003.
5. Nathe CN. Dental public health & research: contemporary practice of the dental hygienist, 3<sup>rd</sup> ed. Upper Saddle River, NJ: Prentice Hall, 2011.

6. National Maternal and Child Oral Health Resource Center. Safety net dental clinic manual. 2011. At: <http://dentalclinicmanual.com>.
7. National Maternal and Child Oral Health Resource Center. At: <http://www.mchoralhealth.org>.
8. Professional organizations such as the:
  - American Association of Public Health Dentistry.
  - Public Health Foundation.
  - Indian Health Service.
  - Association of State and Territorial Dental Directors.
  - National Network for Oral Health Access.

## **Dental Materials**

### **I. Introduction**

The content offers an educational background that is needed to provide students with the knowledge and skills necessary to ensure that quality dental hygiene care is provided to the patients they treat. As research in biomaterials advances, and as the scope of dental hygiene practice increases, the guidelines should be reviewed and revised.

A. Definition of the discipline: Biomaterials is the science and technology of materials used in dentistry; it is the dental application of principles from the parent field of materials science and may also be called “dental materials” and other synonyms. The range of biomaterials applications includes all restorative materials in all dental specialties, laboratory, materials, dental instruments and dental devices related to the use of materials.

B. Definitions of key words and phrases:

1. Fundamental clinical dental hygiene skills: Those skills that are routinely performed by the dental hygienist and/or taught to clinical competency in most dental hygiene programs and/or that are legal in most states.
2. Expanded clinical dental hygiene skills: Those components of care not typically included in the majority of dental hygiene curricula; or those currently included in most dental hygiene practice acts, but within the possibilities of practice for dental hygienists.

### **II. Interrelationship**

A dental materials curriculum for dental hygienists relates to all dental disciplines, including clinical dental hygiene; basic dental sciences; and clinical dental sciences, such as radiology, restorative dentistry and dental specialties. An understanding of the science of dental materials is essential to assess patient needs, plan for and treat these needs, evaluate treatment outcomes, educate the patient and participate in intra- and interdisciplinary collaborative practice.

### **III. Overview**

A study of the clinical application of dental materials and their relationship to the oral environment is essential for the dental hygienist. The dental



hygienist should be knowledgeable in the science of dental materials so that he/she understands the behavior of materials, handles materials properly and is able to educate the patient about the materials. The content of the curriculum should provide both a theoretical and laboratory/clinical practice foundation of knowledge for the dental hygiene student. From this knowledge base, the delivery of preventive and restorative care in a variety of practice settings and collaboration may be provided.

#### **IV. Primary Educational Goals**

The curriculum should provide the dental hygiene student with a sound knowledge base in the science of dental materials. Emphasis should not only be placed on the techniques of manipulating materials, but also on the properties of material and the reasons specific materials are selected.

Upon completion of the dental materials curriculum, the student will be able to:

- A. Apply principles of professional and ethical behavior when providing all dental hygiene services.
- B. Educate the patient about dental procedures involving dental materials and the proper maintenance of restorations and oral prostheses.
- C. Provide a variety of high-quality therapeutic and preventive services involving selection and manipulation of appropriate dental materials within the dental hygiene scope of clinical practice.
- D. Make appropriate clinical judgments in the selection and use of dental materials and their subsequent reaction in the oral environment.
- F. Educate patients on the materials selected and any subsequent changes needed in oral hygiene to maintain optimum oral health.
- G. Effectively collaborate both intra- and interprofessionally within the scope of dental hygiene practice involving the selection and manipulation of dental materials.

Mastery of the following cognitive areas and psychomotor skills should lead to course competence in dental materials:

- A. Understanding physical, chemical and biologic properties of specific dental materials.
- B. Relating these properties to the selection, manipulation and care of dental materials used within the dental hygiene scope of practice.
- C. Recognizing, selecting and applying dental materials used in preventive and therapeutic dental procedures to provide quality patient care.
- D. Demonstrating current, acceptable aseptic and safety procedures in both laboratory and clinical settings when using a given material, instrument or equipment or providing therapeutic or preventive services.

## V. Prerequisites

To grasp the basic concepts of a course in dental materials and provide the related clinical dental hygiene services, the student should have a basic foundation in the following areas: fundamental dental hygiene skills, patient management, chemistry, head and neck anatomy, dental anatomy, histology, microbiology and radiology.

## VI. Core Content

The core content in dental materials consists of two major sections. The first contains topics and skills taught in the majority of dental materials courses for dental hygienists. The second incorporates additional topics and skills taught in some dental materials/expanded functions courses for dental hygienists. Each section is divided into cognitive, psychomotor and affective domains of learning. The scope of dental hygiene practice differs from state to state and is regulated by individual state practice acts. The sequencing of the outline is taken in part from *Clinical Aspects of Dental Materials: Theory, Practice and Cases*, 4<sup>th</sup> ed., by Gladwin/Bagby.

- A. Basic core content: didactic.
  - 1. Introduction to dental materials.
    - a. Rationale for study.
    - b. Materials and the oral environment.
    - c. Historical aspects.
    - d. Regulation for dental materials.
    - e. Classification of materials.

2. Materials science.
  - a. Materials science (definitions).
  - b. Atomic bonding.
  - c. Materials and their atomic bonding.
3. Physical and mechanical properties of dental materials.
  - a. Properties of materials defined.
  - b. Physical properties (density, vapor pressure, thermal conductivity, etc.).
  - c. Mechanical properties (elasticity, stress, strain, etc.).
4. Adhesive materials.
  - a. Adhesive materials in dentistry:
    - (1) Adhesion/bonding.
    - (2) Development.
    - (3) Surface factors.
  - b. Acid etching.
  - c. Dentinal bonding.
  - d. Glass ionomers.
5. Direct polymeric restorative materials.
  - a. Acrylic resins:
    - (1) Steps in addition polymerization.
    - (2) Activation options of addition polymerization.
  - b. Problems with unfilled resins.
  - c. Improvements to dental resins.
  - d. Composite materials:
    - (1) Components of composites.
    - (2) Polymerization systems.
    - (3) Types and properties of dental composites.
    - (4) Uses.
    - (5) Factors affecting use.
    - (6) Placement.
  - e. Pit and fissure sealants.
  - f. Preventive resin restorations.
  - g. Composite cements.
  - h. Glass ionomer materials.
  - i. Compomers.

6. Amalgam and direct metallic restorative materials.
  - a. Amalgam defined.
  - b. Advantages of using amalgam.
  - c. History of amalgam.
  - d. Low copper dental amalgam.
  - e. High copper dental amalgam.
  - f. Factors affecting handling and performance.
  - g. Amalgam properties (strength, creep corrosion, etc.).
  - h. Use of dental amalgam:
    - (1) Effect of moisture.
    - (2) Finishing and polishing.
    - (3) Mercury toxicity.
  - i. Direct gold restorations (gold foil).
7. Dental implants as a dental material.
  - a. Dental implants defined.
  - b. Materials used for dental implants.
  - c. Types of dental implants.
  - d. Maintenance of dental implants.
  - e. Use of implants.
8. Dental cements.
  - a. Uses:
    - (1) Luting agents.
    - (2) Pulp protection.
    - (3) Temporary restoration.
    - (4) Cavity sealers.
  - b. Chemistry.
  - c. Powders used in dental cements.
  - d. Liquids used in dental cements.
  - e. Powder/liquid ratios and systems of dental cements.
  - f. ZOE cement.
  - g. Zinc phosphate cement.
  - h. Glass ionomer cement.
  - i. Polycarboxylate cement.
  - j. Composite cement.
  - k. Other cements and uses.
9. Impression materials.
  - a. Background information (available systems, trays, cost, etc.).
  - b. Classification.
  - c. ZOE impression material.

- d. Hydrocolloid impression material:
    - (1) Irreversible.
    - (2) Reversible.
  - e. Elastomeric (rubber) impression materials.
- 10. Gypsum materials.
  - a. Properties.
  - b. Types:
    - (1) Plaster.
    - (2) Stone.
    - (3) Improved stone.
  - c. Setting reaction.
  - d. Water/powder ratio.
  - e. Setting time.
  - f. Properties.
  - g. Technique of use.
- 11. Materials for fixed indirect restorations/prostheses.
  - a. Types.
  - b. Classification by tooth structure restored.
  - c. Classification by material.
  - d. Procedures for constructing an indirect restoration.
  - e. Alloys for all-metal cast restorations.
  - f. Alloys for ceramometal restorations.
  - g. All-ceramic restorative materials.
  - h. Composite indirect materials.
  - i. Advantages/disadvantages of all-metal/ceramometal/ceramic restorations.
- 12. Removable prostheses and acrylic resins.
  - a. Acrylic resin defined.
  - b. Types (forms) of acrylic resin.
  - c. Complete dentures.
  - d. Construction of a complete denture.
  - e. Partial dentures.
  - f. Relining a denture.
  - g. Immediate dentures.
  - h. Repairing acrylic prostheses/appliances.
- 13. Radiographic appearance of dental tissues and materials.
  - a. Rationale for integrating radiology and dental materials.
  - b. Restorative materials categorized by radiographic appearance.

- c. Radiographic descriptions of dental tissues and materials.
  - d. Radiographic appearance of dental implants.
- 14. Polishing materials and abrasion.
  - a. Definitions.
  - b. Types of abrasives.
  - c. Bonded and coated abrasives.
  - d. Factors affecting the rate of abrasion.
  - e. Polishing process:
    - (1) Reasons to polish.
    - (2) Selective polishing as it relates to materials.
- 15. Tooth whitening.
  - a. Treatment options.
  - b. Causes of tooth discoloration.
  - c. Whitening agents.
  - d. Whitening techniques.
  - e. Side effects of whitening.
- 16. Oral appliances.
  - a. Types.
  - b. Material used in fabrication.
  - c. Fabrication of an oral appliance.
  - d. Maintenance of oral appliances.
- 17. Infection control and safety.
  - a. Disinfection of impressions.
  - b. Disinfecting dentures and other appliances.
  - c. Infection control protocol for laboratory procedures.
  - d. Physical hazards (lathes, model trimmers, respiratory, etc.).
  - e. Chemicals.
  - f. MSDS/SDS sheets.
- B. Core content: laboratory/clinical practice.
  - 1. Rubber dam.
    - a. Rationale.
    - b. Armamentarium.
    - c. Placement.
    - d. Removal.

2. Impressions for study casts.
  - a. Armamentarium.
  - b. Preparation of tray and material.
  - c. Placement and removal of tray.
  - d. Storage.
3. Temporary restorations.
  - a. Types.
  - b. Purpose.
  - c. Armamentarium.
  - d. Preparation of material.
  - e. Placement and removal.
4. Fabrication and trimming study models.
  - a. Construction of a study model.
  - b. Trimming casts or study models.
5. Debonding orthodontic resins.
  - a. Objective.
  - b. Debonding procedure.
  - c. Post-debonding considerations.
6. Pit and fissure sealants.
  - a. Purpose and indications.
  - b. Contraindications.
  - c. Procedure.
  - d. Post-sealant evaluation.
7. Whitening tray fabrication (and mouth protectors).
  - a. Purpose and indications.
  - b. Contraindications.
  - c. Procedure (including all three appointments).

**OPTIONAL:** Additional Content Section.

- A. Didactic content.
  1. Wax and impression compound.
  2. Bite registration materials.
  3. Computer-aided design and manufacturing (CAD/CAM).
  4. Lost wax casting process.
    - a. Waxing.
    - b. Investing.
    - c. Burn-out.

5. Specialty materials.
  - a. Orthodontics.
  - b. Endodontics.
  - c. Periodontics.
  - d. Pediatric dentistry.
- B. Laboratory/clinical practice.
  1. Matrices.
    - a. Armamentarium.
    - b. Preparation of band and retainer.
    - c. Placement and removal.
    - d. Wedging and stabilization.
  2. Amalgam restorations.
    - a. Classification of caries.
    - b. Armamentarium.
    - c. Preparation/isolation.
    - d. Condensing amalgam.
    - e. Carving techniques.
    - f. Finishing and polishing amalgam.
    - g. Removing overhanging restorations/  
margination.
  3. Esthetic restorations.
    - a. Armamentarium.
    - b. Acid-etch and bonding techniques.
    - c. Preparation and placement of restorative  
materials.
    - d. Finishing restoration.
  4. Custom impression tray fabrication.
    - a. Purpose.
    - b. Construction procedure.
    - c. Trimming the tray.
  5. Interim crowns.
    - a. Methods.
    - b. Construction of a temporary crown.
    - c. Trimming the crown.

## **VII. Behavioral Objectives**

The following behavioral objectives for the basic core content are divided in the cognitive, psychomotor and affective domains.



A. Core content: didactic.

Cognitive domain: Upon completion of the dental materials curriculum, the student will be able to carry out the following.

1. Introduction to dental materials.
  - a. Summarize the reasons why a dental hygienist should be knowledgeable in the science of dental materials.
  - b. Discuss some of the conditions that make the oral cavity a hostile environment.
  - c. Identify four characteristics or properties a dental material must possess to survive in the oral environment.
  - d. Explain how the following organizations regulate, evaluate and/or classify dental drugs, materials, instruments and equipment:
    - American Dental Association (ADA).
    - U.S. Food and Drug Administration (FDA).
    - International Standards Organization (ISO).
  - e. Name three ways dental materials may be classified, and discuss each.
2. Materials science.
  - a. List the phases into which materials are classified. Discuss the varying amounts of attraction between the molecules and atoms of each phase. Recall the differentiating characteristics of each phase.
  - b. Explain the basic difference between primary and secondary bonds.
  - c. Name the three types of primary bonds and describe the differences between them.
  - d. Summarize the similarities and differences of secondary bonds, which include permanent dipoles, hydrogen bonds and fluctuating dipoles.
  - e. Contrast the bonding characteristics of metals, ceramics, plastics and composites.
3. Physical and mechanical properties of materials.
  - a. Describe or define the key words and phrases.
  - b. Relate the physical properties of materials discussed in the chapter to their use in dentistry.

- c. Define wetting. Include in the definition a drop of liquid and the contact angle formed with the surface.
  - d. Name the units of measure for the following properties:
    - Density.
    - Heat capacity.
    - Stress.
    - Strain.
    - Modulus of elasticity.
  - e. Define “proportional limit,” and name two other nearly equivalent terms.
  - f. Name the four types of stress, and provide an example of each found in everyday life.
  - g. Describe two situations in which dental materials are subjected to bending stresses when in function.
  - h. Compare the properties of “toughness” and “hardness,” and provide examples of each.
  - i. Explain the difference between stress relaxation and creep.
  - j. Discuss the phenomenon of stress concentration, and compare its effects on a poorly placed amalgam restoration as well as on a properly placed one.
  - k. Describe the properties inherent to dental materials that make them vulnerable to damage during instrumentation with conventional instruments.
4. Adhesive materials.
- a. Describe an adhesive.
  - b. Explain the difference between micromechanical bonding and macromechanical bonding, and provide an example of each type.
  - c. Recall three benefits the patient receives from restorations that are bonded to tooth structure.
  - d. Compare the differences of the microanatomy of enamel and of dentin regarding etching and bonding. The comparison should include the following terms:
    - Orthophosphoric acid.
    - Enamel tags.
    - Smear layer.
    - Primer.
    - Adhesive.
  - e. Discuss two of the earlier fallacies about dentinal bonding and how research has changed current practice.

- f. Summarize the main differences between glass ionomer cements and dentinal bonding.
5. Direct polymeric restorative materials.
  - a. Name the two types of polymerization reactions commonly seen in dental materials, and explain the meaning of “addition” in “addition polymerization.”
  - b. Discuss the following properties of restorative resins:
    - Polymerization shrinkage.
    - Coefficient of thermal expansion.
    - Abrasion resistance.
  - c. Summarize the relationships among a filler particle, the matrix and the coupling agent of a composite restorative material.
  - d. Compare the advantages and disadvantages of light-cure and chemical-cure composite materials.
  - e. Summarize the importance of the following properties in relation to the fillers (particles) found in dental composites:
    - Composition.
    - Size.
    - Amount.
    - Abrasion resistance.
    - Refractive index.
    - Clinical detection.
  - f. Choose one of the three types of dental composites, and justify its use in the following dental situations:
    - Bonding orthodontic brackets to enamel.
    - Class V “gingival notch” restoration.
    - Small Class I or II restoration.
  - g. Discuss the role the dental hygienist should play in the placement and maintenance of pit and fissure sealants.
  - h. Briefly describe “preventive resin restoration” and “composite cements.”
  - i. Assess the positive and negative characteristics of light-cure and chemical-cure glass ionomer cements.
  - j. Discuss the similarities between compomers, glass ionomers and composites.
6. Amalgam and direct metallic restorative materials.
  - a. Differentiate between an amalgam alloy and a dental amalgam.

- b. Describe the composition of conventional and high-copper dental amalgams.
  - c. Describe the function (effects) of the major elements of dental amalgams.
  - d. Discuss the factors that affect the manipulation and performance of amalgam.
  - e. Describe acceptable mercury hygiene practices.
7. Dental cements.
- a. Describe the use of dental cements as a:
    - Luting agent.
    - Base.
    - Filling material.
    - Temporary restoration.
    - Intermediate restoration.
    - Periodontal pack.
    - Temporary cement.
  - b. Explain the importance of adhesion and microleakage to the clinical use of a dental cement.
  - c. Differentiate between a base and a liner.
  - d. Describe the use of a cavity varnish or cavity sealer.
  - e. Describe the relative properties of the component liquids and powders of dental cements.
  - f. Explain the setting reaction of a typical dental cement.
  - g. Based on the properties of the liquid and the powder, discuss the properties of:
    - Zinc oxide-eugenol (ZOE) cement.
    - Zinc phosphate cement.
    - Polycarboxylate cement.
    - Glass ionomer cement.
    - Composite cement.
    - Calcium hydroxide base.
8. Impression materials.
- a. Differentiate between a model, a cast and a die.
  - b. Describe the various types of impression trays.
  - c. List the desirable qualities of an impression material.
  - d. Differentiate between:
    - Elastic and inelastic impression materials.
    - Reversible and irreversible impression materials.

- e. Describe the composition and setting mechanism of:
    - Zinc oxide-eugenol (ZOE).
    - Agar or reversible hydrocolloid.
    - Alginate.
    - Condensation silicones.
    - Polyethers.
    - Addition silicones.
  - f. Compare the properties, use and cost of the above impression materials.
  - g. Describe the effect of water temperature on the setting rate of alginate.
9. Gypsum materials.
- a. Define the following terms: study model, cast and die.
  - b. Discuss the major differences among dental plaster, stone and improved stone.
  - c. Explain the meaning of initial and final setting times.
  - d. Give three examples of how to increase and decrease the setting times of gypsum products.
  - e. Discuss wet and dry strength as it relates to gypsum products.
  - f. Summarize the recommended technique for use of gypsum products for measuring, mixing and filling the impression. Include hand and vacuum mixing.
10. Materials for fixed indirect restorations and prostheses.
- a. Discuss the classification of fixed indirect restorations by both the amount of tooth structure restored and by material.
  - b. Discuss the factors that affect treatment planning for a fixed indirect restoration.
  - c. Describe the types of alloys used to make all-metal crowns, ceramometal crowns and partial denture frameworks.
  - d. Recall the types of porcelain used to simulate the color of teeth.
  - e. List the advantages and disadvantages of all-metal, ceramometal and all-ceramic restorations.

11. Removable prostheses and acrylic resins.
  - a. List the uses of acrylic resins in dentistry.
  - b. Describe the function of the components of heat-cure and cold-cure acrylic resin systems.
  - c. Describe the steps involved in construction of a denture.
  - d. Summarize the procedures used to reline a denture.
  - e. Define "immediate denture."
  - f. Explain a dental hygienist's role in maintenance of an acrylic prosthesis.
12. Radiographic appearance of dental tissues and materials.
  - a. Discuss the rationale for integrating radiology and dental materials.
  - b. Identify various dental tissues, materials and dental implants on a radiograph.
  - c. Explain why, radiographically, dental tissues and materials appear radiopaque or radiolucent.
  - d. Integrate the radiographic appearance of dental tissues and materials with clinical information to assess the patient's status of health or disease.
13. Polishing and abrasion.
  - a. Briefly define the following terms:
    - Cutting.
    - Abrasion.
    - Finishing.
    - Polishing.
    - Abrasive.
  - b. Recall six common abrasives that may be used for clinical or laboratory procedures.
  - c. Summarize factors that may influence the rate of abrasion, and explain why the dental hygienist must have a clear understanding of these factors when providing patient care.
  - d. Discuss the reasons why tooth structure and restorations are polished.
  - e. Recall the details of the polishing process. Include the series of steps, scratches produced and wavelength of visible light.
  - f. Explain the relationship of dental materials, including dental implants and polishing.

14. Tooth whitening.
  - a. Define tooth whitening, and explain the difference between vital and nonvital tooth whitening.
  - b. Explain the difference between intrinsic and extrinsic stains, and list examples of each.
  - c. Identify two chemical agents used for vital tooth whitening, and explain the process by which whitening agents whiten teeth.
  - d. Identify two chemical agents used for nonvital tooth whitening.
  - e. List the factors that affect the success of tooth whitening.
  - f. Compare and contrast patient-applied and professionally applied vital whitening.
  - g. Recall the two common side effects of tooth whitening, and discuss the recommended treatment for alleviating them.
15. Oral appliances (including custom fluoride trays and mouth protectors).
  - a. List the different oral appliances used in dentistry.
  - b. Name the different thermoplastic materials used in the fabrication of oral appliances, and discuss the properties of these materials.
  - c. Explain the steps involved in fabricating an oral appliance.
  - d. Describe the proper maintenance of oral appliances.
  - e. Prepare a script or dialogue that may be used for patient education regarding oral appliances.
16. Infection control and safety.
  - a. Describe an effective infection control protocol for handling impressions and dental appliances that are transferred between the dental operator and the dental laboratory within the dental office or to an outside commercial laboratory.
  - b. Discuss and demonstrate the procedure for disinfecting dental impressions.
  - c. Explain and demonstrate the procedure for disinfecting dentures and other dental appliances after they have been processed or adjusted.

- d. Describe and apply the infection control protocol and safety procedures that must be followed when grinding or polishing dentures and other appliances.
    - e. Review the preferred method (or methods) of sterilizing or disinfecting instruments or items used during manipulation of dental materials and prostheses.
    - f. Describe the infectious, physical and chemical hazards in a dental office.
    - g. Recognize office and laboratory housekeeping practices that contribute to infection control and safety.
  - 17. Interpret and evaluate dental materials and expanded functions literature and research findings.
  - 18. Integrate knowledge from basic science and dental hygiene science courses with dental materials content to assist in problem-solving.
  - 19. When presented with a case study involving dental materials and expanded procedures knowledge, use critical thinking skills to assess, plan, implement and evaluate dental hygiene care.
- B. Core content: laboratory/clinical practice.

Cognitive domain: Upon completion of a dental materials and/or expanded functions curriculum, the student will be able to carry out the following.

- 1. Rubber dam.
  - a. Provide rationale for placement.
  - b. List the necessary armamentarium.
  - c. List steps needed to prepare for placement.
  - d. Explain steps in placement and removal.
- 2. Make impressions for study casts.
  - a. List the necessary armamentarium.
  - b. Explain proper tray preparation and correct manipulation of impression material.
  - c. Describe proper placement and removal of tray.
  - d. Explain proper storage of impression material.



3. Fabrication and trimming of study models.
  - a. Identify preparation procedures.
  - b. Discuss the purpose(s) and indication(s) for fabricating a study model.
  - c. List the steps for pouring a model for both a single and double pour and the boxing wax technique.
  - d. List the steps in trimming a study model.
4. Placing and removing temporary restorations.
  - a. Review types of temporary restorations.
  - b. List purpose for placement.
  - c. Describe proper preparation of material.
  - d. List steps in placement.
  - e. Describe proper removal.
5. Debonding orthodontic resins.
  - a. Define debonding.
  - b. State the objective of debonding.
  - c. Discuss the problems associated with improper debonding techniques.
  - d. List the steps in the debonding procedure.
  - e. Recall the post-debonding considerations.
  - f. List the precautions associated with the debonding procedure.
6. Pit and fissure sealants
  - a. List the necessary armamentarium.
  - b. Discuss the purpose, indications and contraindications.
  - c. Recall the different types of sealant material.
  - d. List the steps in the sealant placement procedure.
  - e. Discuss the occlusal adjustment procedure after placing sealants.
  - f. Describe the evaluation process.
7. Oral appliance custom tray fabrication
  - a. List the necessary armamentarium.
  - b. Recall the purpose, indication and contraindications.
  - c. List the clinical procedure that includes all three appointments.
  - d. Discuss the steps in the laboratory procedure.
  - e. Describe any precautions that should be taken during tray construction.

C. Psychomotor domain.

At the completion of the dental materials curriculum, the student will consistently be able to:

1. Apply principles and techniques when proportioning and manipulating all dental materials that are within the dental hygienist's scope of practice.
2. Consider variables in manipulation of dental materials that may influence the desired outcome.
3. Initiate or implement procedures to eliminate errors during manipulation of dental materials that are within the dental hygienist's scope of practice.
4. Appropriately manage all dental restorative materials during patient care.
5. Apply principles of infection control and safety when manipulating dental materials.

D. Affective domain.

At the completion of the curriculum, the student will be able to:

1. Apply principles and techniques for evaluating results of dental materials selection.
2. Self-assess ability consistently to perform all dental hygiene services at acceptable standards of care.
3. Use an objective approach in problem-solving when manipulating dental materials and performing expanded function procedures.
4. Communicate effectively and display professional interpersonal skills.

**VIII. Sequencing**

Given the differences in curricula length of programs and length of course, sequencing should remain flexible. The course should be incorporated into the curriculum when the dental hygiene student is at a level to deliver services that requires knowledge and use of dental materials.

## **IX. Faculty**

The curriculum in dental materials for dental hygienists should include faculty with an educational background and experience in the science of dental materials along with the requisite expertise for teaching the concepts and skills of dental materials and their relationship with the entire curriculum. Faculty should have a background in educational methods, testing and measurement and evaluation.

## **X. Facilities**

Facilities should be adequate to provide students both didactic and laboratory experience to meet the objectives of the dental materials course as it relates to the dental hygiene curriculum. Facilities should be adequate to allow students to participate in dental materials research on an elective basis.

## **XI. Occupational Hazards**

Special care must be taken to provide a safe environment for individuals using or coming into contact with specific dental materials and equipment. Practical limitations prevent developing a complete listing of all potential occupational hazards and safety precautions. Manufacturers supply additional information on specific materials and equipment.

In addition, the OSHA's standard for occupational exposure to bloodborne pathogens is recommended in all laboratory and clinical areas. This includes the guidelines of standard precautions, safe handling of supplies and materials, elimination and/or reduction of physical hazards and chemicals and an established plan for emergencies.

## **XII. Educational Strategies**

- i. Require students to view technique-related videos prior to lab.
  2. Require or request student volunteers to provide demonstrations of laboratory techniques.
  3. Develop psychomotor objectives for laboratory activities and subsequently require students to write the objectives.
  4. Include a student self-evaluation component for rubrics for all laboratory activities.
  5. Assign students to complete a written evaluation of a peer-reviewed journal article, dental material or technique.

6. Ask students to give oral presentations on topics of interest to a course in dental materials.
7. Complete or create crossword puzzles for topics in dental materials. There are free websites allowing easy creation of crossword puzzles.
8. Assign an individual or group project requiring the development of a dental materials case that could include the following information:
  - a. Patient medical, dental and social history.
  - b. Clinical presentation of restorative needs, including the identified classification of caries.
  - c. Radiographic presentation, including the radiographic classification of caries.
  - d. Development of a treatment plan.
  - e. Explanation of required dental laboratory procedures.
  - f. Written and/or verbal presentation by the student.(The project could require inclusion of information from other courses in the curriculum.)

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Student Activity:

Online continuing education courses available at: [www.ineedce.com](http://www.ineedce.com).

This site allows students to access peer-reviewed articles. The site is great for a project requiring students to identify journal articles concerning a new dental material or technique. Students identify the answers to given questions and then develop a short PowerPoint presentation (including a visual) to present to the class.

## **Medical Emergencies**

### **I. Introduction**

As the quality of health care improves, more patients with serious systemic illnesses are seeking dental services. Because some systemic diseases, or the therapy used to treat those diseases, may compromise the patient's ability to undergo routine dental treatment uneventfully, the dental hygienist must continually improve his/her ability to detect those diseases and to cope with systemic emergencies that might occur during dental treatment. Therefore, dental hygienists should have adequate training in the recognition of serious systemic emergencies and the early management of these problems within and outside the dental office. Professional competence in this area includes an ability to thoroughly evaluate a patient's general health and take proper measures to prevent anticipated emergencies wherever possible.

### **II. Educational Goal**

Instruction in the recognition and management of medical emergencies should be sufficient for the student to develop an orderly and confident approach to the diagnosis and supportive care of an acutely ill person whose life is endangered.

### **III. Prerequisites**

The instructional unit in medical emergency management should begin as part of the core basic science program and continue throughout the student's clinical training. It requires no changes in the standard basic science core as long as that core includes general anatomy, physiology, pathology, pharmacology and therapeutics. Certification in cardiopulmonary resuscitation (CPR) should be obtained before beginning the dental hygiene program.

### **IV. Course Content**

Initially, the total instructional unit should include a didactic and laboratory component (where applicable) that is then reinforced throughout the student's clinical experiences by either real or simulated emergencies. Some of the instructional components could be provided as part of the basic science core and others associated with clinical courses. However, these components should be carefully coordinated to prevent any conflicts in content information, so that the student will develop a clear, consistent, organized understanding of

the subject. It is suggested that each student be certified according to the standards set by the American Heart Association and/or the American Red Cross at the basic life health care provider level.

## V. Core Content Outline

- A. Prevention of medical emergencies.
  - 1. Medical history.
    - a. American Society of Anesthesiologists (ASA) physical status.
  - 2. Physical evaluation.
  - 3. Treatment planning modifications.
- B. Preparation for managing medical emergencies.
  - 1. Office preparedness and staff designation.
  - 2. Staff training.
  - 3. Emergency drugs.
    - a. Oxygen.
    - b. Analgesics.
    - c. Vasopressors.
    - d. Vasodilators.
    - e. Anti-hypoglycemics.
    - f. Anti-allergic antihistamines.
    - g. Bronchodilators.
    - h. Hydrocortisone.
  - 4. Emergency equipment.
    - a. Respiratory.
    - b. Cardiovascular.
  - 5. Emergency techniques.
    - a. Cardiopulmonary resuscitation.
    - b. Management of obstructed airway.
    - c. Use of self-inflating bag, mask and airway management.
    - d. Cricothyrotomy.
  - 6. Describe and demonstrate (where applicable) the following techniques:
    - a. Pulse, blood pressure and respiration determination.
    - b. Parenteral drug administration.
    - c. Use of a positive pressure device such as a bag and mask.
    - d. Cardiopulmonary resuscitation: sufficient to qualify the student as certified at the basic life support according to the standards set by the American Heart Association and/or the American Red Cross.
    - e. Chest or abdominal thrusts.

- C. Medico-legal aspects of medical emergencies.
  - 1. Use of appropriate documentation for emergencies.
  - 2. Recording of baseline vitals.
  - 3. Document prodromal signs and symptoms.
  - 4. Record treatment rendered during the emergency.
  - 5. Conclusions of treatment (end result).
  - 6. Follow-up treatment.
  - 7. Reporting to the state board of dentistry.
- D. Physical signs and symptoms that may herald developing medical emergencies.
  - 1. Skin pallor.
  - 2. Cold/sweating.
  - 3. Malaise.
  - 4. Emesis.
  - 5. Altered sensation or unusual sensation.
  - 6. Altered pulse or blood pressure.
  - 7. Uncontrolled hemorrhage.
  - 8. Loss of consciousness.
  - 9. Altered consciousness.
  - 10. Respiratory difficulty.
- E. Recognition and management of common medical emergencies, including but not limited to the following:
  - 1. Syncope.
  - 2. Angina pectoris.
  - 3. Myocardial infarction/cardiac arrest.
  - 4. Hypertension.
  - 5. Hypotension.
  - 6. Shock.
  - 7. Hypoglycemia.
  - 8. Hyperglycemia.
  - 9. Generalized tonic clonic seizure.
  - 10. Generalized absence seizure.
  - 11. Mild/moderate allergic reaction.
  - 12. Anaphylaxis.
  - 13. Asthma.
  - 14. Hyperventilation.
  - 15. Cerebrovascular accident.
  - 16. Hemorrhage.
  - 17. Acute adrenal insufficiency.
  - 18. Airway obstruction.
  - 19. Heart failure.
  - 20. Anesthetic overdose.
  - 21. Broken instrument.
  - 22. Foreign body in the eye.
  - 23. Avulsed tooth.
  - 24. Burns.



25. Dislocated jaw (due to trauma/fractures, subluxation, etc.).
26. Myxedema coma.
27. Thyroid storm.
28. Pacemaker/ICD malfunction.
29. Drug overdose.

## VI. Behavioral Objectives

The instructional unit for the management of medical emergencies should provide the dental hygiene student with the knowledge, judgment and skills to be able to:

- A. Describe significant emergency preventive measures.
  1. Differentiate the goals or pretreatment physical and psychological evaluation of the patient.
  2. For each question on the medical and dental histories, develop follow-up questions to assess the patient's risk of an emergency or need for treatment modification.
  3. Discuss the relationship of various vital signs to potential emergency situations.
  4. Describe methods for evaluating patients' anxiety levels and methods to reduce patient anxiety.
  5. Relate ASA classifications to potential medical emergencies.
- B. Describe activities and equipment needed to prepare for dental office emergencies.
  1. Maintain current CPR certification.
  2. Discuss various aspects of an adequate emergency kit and emergency equipment.
    - a. List items that might be considered "critical" or "secondary."
    - b. Recognize other drugs and types of equipment that could be included in an emergency kit.
    - c. Differentiate the use of various drugs and equipment that might be found in the emergency kit.
    - d. Demonstrate effective methods for drawing and presenting drugs.
    - e. Describe and demonstrate effective methods for using and delivering oxygen.
    - f. Demonstrate effective method for using an automatic external defibrillator (AED).
    - g. Demonstrate team assignments in response to emergency situations.
- C. Describe the medicolegal implications of medical emergencies.
  1. Define and discuss:
    - a. Standard of care.
    - b. Duty to act.

- c. Consent.
- d. Abandonment.
- e. Negligence.
- D. Differentiate appropriate responses to the following emergency situations.
  - 1. Unconsciousness.
    - a. Syncope.
    - b. Postural hypotension.
    - c. Acute adrenal insufficiency.
  - 2. Respiratory distress.
    - a. Airway obstruction.
    - b. Hyperventilation.
    - c. Asthma.
    - d. Allergic reactions.
  - 3. Altered consciousness.
    - a. Diabetes mellitus: insulin shock and diabetic coma.
    - b. Cerebrovascular accident.
  - 4. Seizures.
    - a. Generalized tonic clonic.
    - b. Generalized absence.
  - 5. Drug-related emergencies.
    - a. Drug overdose.
    - b. Local anesthetic toxicity.
    - c. Epinephrine toxicity.
  - 6. Chest pain and cardiac arrest.
    - a. Angina.
    - b. Acute myocardial infarction.
    - c. Cardiac arrest.
    - d. Heart failure.
  - 7. Others.
    - a. Hemorrhage.
    - b. Shock.
    - c. Burns.
    - d. Foreign body in the eye.
    - e. Chemical solution in the eye.
    - f. Dislocated jaw (due to trauma/fracture, subluxation, etc.).
    - g. Broken instrument.
    - h. Avulsed tooth.
  - 8. For any emergency situation that should occur:
    - a. Recognize that an emergency situation exists.
    - b. Discuss the general considerations.
    - c. Compare predisposing factors.
    - d. Discuss possible prevention strategies.

- e. Propose related dental therapy considerations and modify treatment as required.
- f. Recognize signs and symptoms.
- g. Effectively evaluate clinical manifestations.
- h. Demonstrate effective management and treatment.
- i. Identify what medications are needed, if any, the dosage, and the route of administration as indicated.
- j. Compare differential diagnosis.

## **VII. Sequencing**

Part of the instruction should be incorporated into the basic science core curriculum, and part should occur in conjunction with student clinical training. The time devoted to this subject will vary.

## **VIII. Faculty**

One faculty member should be designated as coordinator of this content area and responsible for assuring continuity of input by the participating disciplines. That individual should be certified as an instructor in CPR by the American Heart Association or by the American Red Cross. Additionally, several trained faculty members should be qualified to teach this subject and manage dental medical emergencies in the clinical environment. The faculty should challenge the student throughout his/her clinical education to assure that the student is appropriately prepared in this subject prior to graduation. In addition, faculty should have a background in educational methods, testing, measurement and evaluation.

## **IX. Continuing Clinical Application**

All clinical faculty should be certified at basic life support level by the American Heart Association and/or the American Red Cross. All clinical faculty members should be thoroughly familiar with the contents of this instructional unit, so that in an emergency in the clinic, they will act in accordance with the procedures established and taught to the students. A published emergency plan should be developed and reviewed periodically with the faculty and staff by the coordinator. This assures continuity between information presented in the instructional unit and the student's clinical experience.

## **X. Educational Strategies**

This content is conducive to traditional face-to-face or hybrid delivery. A fully online course is not recommended because the student must have a laboratory/clinical experience to prove competency in medical

emergencies. In a hybrid course, the didactic content is delivered online using best practices, including weekly content modules that may include narrated PowerPoint lectures, textbook readings, websites, videos, podcasts or YouTube videos. Weekly discussion boards and individual or group assignments, such as concept maps, literature reviews, and student-created medical emergency guides, encourage student participation. Assessment may be accomplished through reflective blogs, online quizzes and electronic portfolios. The face-to-face component of a hybrid course should include communication and clinical skills assessment in a laboratory or clinic that may or may not include human patients or high-fidelity manikin simulations. Inclusion of a simulation with debriefing by a qualified instructor and reflective activities will support self-assessment and critical thinking. When available, students should be exposed to medical emergency training in an interprofessional education (IPE) arena, such as EMT/paramedic or physician assistant (PA) programs, to reinforce the dental hygienist's role on the collaborative health care team.

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## **Nutrition**

### **I. Introduction**

These allied dental curriculum guidelines provide an overview of the function and food sources of nutrients essential to systemic and oral health with an emphasis on the role of nutrition in the development and maintenance of the oral tissues through the life cycle.

### **II. Interrelationships**

An understanding of how the body uses nutrients to maintain healthy tissues requires the integration of knowledge from chemistry, biochemistry, anatomy and physiology. This knowledge must then be integrated into dietary assessment and nutrition intervention. Nutrition counseling requires the use of effective communication skills and behavioral strategies to assist the patient in modifying nutrition/dietary habits to reduce the risk of oral and/or systemic disease.

### **III. Overview**

Allied dental students should have some foundational knowledge in chemistry, biochemistry, anatomy, physiology and dental tissues prior to beginning this curriculum. If these courses are not included as requirements in the allied dental curriculum, then an overview of digestion, absorption and metabolism will also be required for each nutrient. The nutrition basics should cover both macronutrients and micronutrients. Attention should also be given to specific life cycle nutrition and health issues that may impact oral health. This information provides the allied dental student with the foundational knowledge in nutrition principles necessary to assist the student in assessing the overall adequacy of a patient's diet and providing dietary intervention.

### **IV. Primary Educational Goals**

Following curriculum completion, the student is expected to:

- A. Identify the function and food sources of nutrients essential to systemic and oral health, with an emphasis on the role of nutrition in the development and maintenance of hard and soft oral tissues.
- B. Demonstrate foundational knowledge of nutritional needs throughout the life cycle as well as the role of nutrition in the prevention and management of both systemic and oral disease.
- C. Demonstrate the implementation of effective approaches to dietary assessment and nutrition counseling in the dental clinic.

#### IV. Prerequisites

At least one semester of college-level chemistry, anatomy, physiology, introductory biochemistry and dental tissues courses.

#### V. Core Content Outline

##### A. Nutrition basics.

1. Introduction to the connection between oral health and nutrition.
2. Guidelines for nutrient intake.
  - a. National standards for planning and assessing nutrient intake.
    1. Dietary Reference Intakes (DRIs).
  - b. Guidelines to plan adequate diets.
    1. MyPlate: <http://www.choosemyplate.gov/dietary-guidelines.html>.
    2. U.S. Dietary Guidelines for Americans.
  - c. Nutritional status of Americans.
    1. Food and nutrient intake trends.
  - d. Cultural aspects of dietary planning.
  - e. Food labeling.
3. Review of digestion and absorption process for nutrients.
  - a. Factors affecting digestion and absorption.
4. Energy balance.
  - a. Components of energy expenditure.
  - b. Recommended energy requirements.
    1. Energy value of nutrients.
  - c. Weight management.
    1. Assessing weight and body composition.
    2. Obesity and implications for oral health.
    3. Undernutrition and implications for oral health.
5. Macronutrients.
  - a. Carbohydrates, proteins and lipids (Fats).
    1. Major functions in the body.
    2. Chemistry and classification.
    3. Digestion, absorption and transport.
    4. Metabolism.
    5. Dietary requirements.
      - a. Recommended Dietary Reference Intake (DRI).
      - b. Food sources.
      - c. Trends in consumption.
        - i. Implications for systemic health.
        - ii. Implications for oral health.
  - b. Water and electrolytes.
    1. Major functions in the body.
    2. Water balance.

6. Micronutrients.

a. Minerals.

1. Macrominerals (calcium, phosphorus, magnesium, sodium, potassium, chlorine and sulfur) and microminerals (iron, zinc, copper, iodine, fluoride, manganese, cobalt, molybdenum, selenium, chromium, silicon, nickel and tin).

a. Major functions.

b. Absorption and metabolism.

c. Requirements.

i. Recommended Dietary Allowance (RDA).

ii. Tolerable Upper Intake Levels.

iii. Sources.

(a) Food.

(b) Supplements.

iv. Oral and systemic implications.

(a) Deficiency.

(b) Excess.

b. Vitamins.

1. Water soluble vitamins.

a) Function of B-complex and C.

b) Chemistry and classification.

c) Requirements.

i. Recommended Dietary Allowance (RDA).

ii. Tolerable Upper Intake Levels.

iii. Sources.

(a) Food.

(b) Supplements.

iv. Oral and systemic symptoms.

(a) Deficiency.

(b) Excess.

2. Fat soluble vitamins.

a. Function of vitamins A, D, E and K.

b. Chemistry and classification.

c. Requirements.

i. Recommended Dietary Allowance (RDA).

ii. Tolerable Upper Intake Levels.

iii. Sources.

(a) Food.

(b) Supplements.

iv. Oral and systemic implications.

(a) Deficiency.

(b) Excess.

B. Nutrition and Oral Health.

1. Dental caries
  - a. Saliva.
    1. Functions and composition.
    2. Critical pH.
  - b. Dental plaque.
    1. Definition and composition.
    2. Chemistry of formation.
    3. Role in dental caries.
    4. Role in periodontal disease.
  - c. Dietary implications.
    1. Dietary influence on plaque (biofilm) pH.
    2. Possible anticariogenic effects of food.
  - d. Prevention of caries.
    1. Fluoride.
    2. Plaque control.
    3. Dietary recommendations.
2. Periodontal diseases.
  - a. Systemic influence of nutrition on periodontium.
    1. Impact of nutrition on immune response.
    2. Defense mechanisms of periodontium.
    3. Repair mechanisms.
  - b. Local effects of food on periodontium.
    1. Physical consistency.
    2. Chemical composition.
  - c. Nutrition recommendations for optimal periodontal health and maintenance.
3. Dental erosion.
  - a. Review of etiology.
  - b. Dietary counseling for prevention of dental erosion.

C. Nutrition care process

1. Nutrition screening to identify patients at risk for poor nutrition.
2. Nutrition assessment.
  - a. Components of assessment.
    1. Physical assessment (general appearance).
    2. Medical history.
      - a. Conditions/diseases that impact nutrient intake.
      - b. Polypharmacy.
        - i. Effects of drugs on nutritional status.
        - ii. Xerostomia.
    3. Dental history.
      - a. Oral conditions impacting nutritional intake.
      - b. Significant changes in oral health.



4. Social history.
  - a. Socioeconomic status.
  - b. Living situation.
  - c. Dietary changes or restrictions.
5. Dental clinical examination.
  - a. Change in caries incidence.
    - i. Gastroesophageal Reflux Disease (GERD).
    - ii. Eating disorders.
    - iii. Xerostomia.
  - b. Unexplained oral lesions noted during extraoral/intraoral examination.
  - c. Periodontal disease out of proportion to local factors.
6. Evaluation of the diet.
  - a. Determining past eating patterns.
  - b. Methods for determining present dietary adequacy.
    - i. 3- to 7-day food record.
    - ii. 24-hour dietary recall.
  - c. Assess cariogenicity of the diet.
  - d. Nutrient analysis.
    - i. Food Guide Pyramid.
    - ii. Dietary Guidelines for Americans.
    - iii. Computer diet assessment.
3. Diet and/or nutrition counseling.
  - a. Identify the priority issues.
  - b. Enlist the patient in setting small measurable goals.
  - c. Generate strategies for reaching goals.
  - d. Follow up to assess progress and set new goals.
4. Nutrition referral.
  - a. Recognize complex issues and refer to primary care provider and registered dietitian (RD) or registered dietitian nutritionist (RDN).
- D. Life cycle nutrition and oral health issues.
  1. Nutrition in pregnancy and lactation.
  2. Infant and childhood nutrition.
    - a. Failure to thrive (FTT).
    - b. Prematurity.
      1. Implications for nutrition and oral health.
        - a. Enamel hypoplasia.
    - c. Feeding issues.
      1. Early childhood caries.
        - a. Incidence.
        - b. Identifying high risk feeding behaviors.
        - c. Preventive strategies.

2. Developmentally disabled.
  - a. Delays in age appropriate feeding skills.
  - b. GERD.
  - c. Polypharmacy.
3. Issues in adolescence.
  - a. Eating disorders.
    1. Oral manifestations.
    2. Referral.
  - b. Osteoporosis prevention.
    1. Nutrition counseling to support attainment of peak bone mass.
4. Issues in adulthood.
  - a. National standards and guidelines for healthy nutrition in medical conditions/disease.
  - b. Issues with implications for wound healing.
    1. Invasive dental treatment.
    2. Oral lesions.
    3. Necrotizing ulcerative gingivitis.
    4. Dietary recommendations.
      - a. Soft and liquid diets.
      - b. High calorie/high protein diets.
5. Nutritional considerations in aging.
  - a. Oral health status & impact on nutrient intake.
    1. Tooth/bone loss.
      - a. Tooth mobility.
      - b. Adjusting to dentures.
    2. Root caries.
    3. Hypersensitivity.
  - b. Psychosocial issues.
    1. Depression and isolation.
    2. Functional issues.
  - c. Tissue changes.
    1. Taste.
    2. Saliva flow (xerostomia).
    3. Mucous membranes.
  - d. Gastrointestinal (GI) changes.
    1. Changes in GI acidity.
    2. Loss of gastric intrinsic factor.
  - e. Changes in immune response.

## **VII. Behavioral Objectives**

At the completion of this course, the student will be able to:

- A. Explain the role of nutrition in the synthesis and maintenance of the oral tissues.
  - 1. Name the classes of essential nutrients, their general function in the growth and development of oral tissues and the food sources of each nutrient.
  - 2. Describe the role of diet in the initiation and progression of dental caries and periodontal disease and dental erosion.
- B. Describe nutrition issues that may impact oral health throughout the life cycle.
  - 1. Discuss dietary measures that may prevent or delay the onset of chronic disease as well as oral diseases.
  - 2. Explain dietary goals for people with chronic disease, such as obesity, diabetes, hypertension and cardiovascular disease, and how it might impact oral health.
- C. Demonstrate appropriate nutrition assessment and dietary counseling techniques for the treatment of nutrition-related dental diseases.
  - 1. Use computer software to determine the nutrient content of his/her own diet, and use nutrient intake guidelines appropriately to evaluate the diet.
  - 2. Identify food factors and eating patterns that may contribute to the development of caries and/or impact healing of oral tissues.
  - 3. Propose appropriate dietary recommendations for a dental patient.

## **VIII. Sequencing**

The most appropriate time for the nutrition course within the overall curriculum is following initial introduction to dental tissues. It may coincide with courses related to oral health prevention and periodontology. This will likely be the end of the first year of the curriculum, which will allow students to use this basic nutrition knowledge for the clinical care of patients as students begin their clinical curriculum.

## **IX. Faculty**

The faculty for this course should have a foundational background in biochemistry and an appropriate education in nutrition. This might include a variety of educational backgrounds, such as a D.D.S./D.M.D. and/or Ph.D. degree, a registered dental hygienist (RDH) or registered dietitian (RD) certification and/or a registered dietitian nutritionist (RDN) certification with a master's degree, along with other coursework in nutrition. Continuing education is also necessary to stay abreast of changing knowledge in the field of nutrition. In addition, faculty should have a background in education methods, testing and measurement, and evaluation.

## **X. Facilities**

No special facilities are required. However, it is recommended that a specific place designed to perform diet consultation (nutritional counseling) with patients be provided where feasible.

## **XI. Educational Strategies**

- Learning management systems, such as Blackboard, can be used to provide course materials and active learning strategies.
- Lecture capture software, such as Camtasia and Echo 360, make live and prerecorded lectures accessible for use in online and hybrid courses.
- For hybrid classroom teaching, classes can be taught on campus with online discussions and incorporate online guest speakers.
- Case study assignments can be integrated for group problem-based learning.
- Automatic response systems (ARS), known as clickers, can be used with synchronous distance education to encourage active learning.
- Discussion boards, blogs and wikis can be incorporated into online learning.
- An e-portfolio system, such as Livetext, can be used for projects like case studies so students can provide a variety of artifacts and samples of their work to demonstrate competence; this tool is also useful in providing samples for program assessment purposes.

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## Oral Anatomy and Histo-embryology

### I. Introduction

Orofacial anatomy is the study of the structures of the head, neck and oral cavity. Topics include tooth morphology, head and neck anatomy, occlusion, histology and embryology.

Tooth morphology is the area of dental science that deals with the structure and form of the tooth. Head and neck anatomy includes the study of the oral cavity and its surrounding structures, including osteology, muscles, nerves, arterial supply, venous drainage, lymphatics, salivary glands and sinuses. Occlusion is described as the relationship between the teeth in the maxillary and mandibular arches, focusing on a working knowledge of the dental arch forms, inter- and intra-arch tooth alignment and intercuspal relationships. Histology and embryology deal with the development of the orofacial complex, including the formation of the enamel, dentin, and pulp, root formation, the attachment apparatus and eruption and shedding of the teeth.

Content related to the teeth, oral tissues and head and neck region of the body may be a fully integrated course or be separate and distinct courses.

### II. Interrelationship

The curriculum for orofacial anatomy is designed for dental hygiene but may be appropriate for dental assisting. Depending on the scope of practice of a dental assistant in various practice locations, the depth and scope of this offering might need to be adjusted. This content serves as foundational knowledge to be applied in other core dental hygiene courses, such as preclinical dental hygiene, radiology, periodontology, oral pathology, dental materials and local anesthesia.

### III. Overview

The content of the curriculum would include the study of facial structures and oral cavity, oropharynx, osteology of the skull, dental anatomy (morphology and form of the permanent and primary dentitions), occlusion, oral histology and embryology and head and neck anatomy (nerves, arteries, muscles, veins, nodes and glands).

#### **IV. Primary Educational Goals**

The primary goal of this course is application of the classroom and laboratory knowledge and skills to patient assessment, dental hygiene diagnosis, treatment planning and provision of health care services. Students should be able to:

1. Recognize and categorize individual teeth according to morphologic differences observed.
2. Comprehend the basic relationship between the morphologic characteristics of the teeth and the potential disease processes affecting them as well as what preventive interventions may accomplish.
3. Understand the basic principles of occlusion and the variables that play important roles in inter- and intra-arch relationships.
4. Integrate the functional and anatomical relationships within the head and neck region in the provision of dental hygiene care.
5. Relate the normal structure of tissues and cells to variations that appear in pathological conditions and disturbances in function, and apply this to clinical situations.
6. Understand the relationship of the oral cavity and head and neck region to the rest of the body.
7. Apply an understanding of neurobiology to the practice of dental hygiene.
8. Use information and knowledge gained from this course in critically analyzing and developing clinical treatment skills.

#### **Prerequisites (Co-requisites)**

It is expected that students will have completed basic biology and anatomy and physiology prior to beginning this content area or that the anatomy and physiology coursework runs concurrently with oral and facial anatomy.

#### **V. Core Content Outline**

##### **General Terminology**

1. Descriptive terms.
2. Facial structures and oral cavity.
3. The tooth: function and terms.
4. Fundamental and preventive curvatures.
5. Dentition.



### **Tooth Morphology**

1. Maxillary incisors.
2. Mandibular incisors.
3. Canines.
4. Maxillary premolars.
5. Mandibular premolars.
6. Maxillary molars.
7. Mandibular molars.
8. Tooth identification.

### **Deciduous Dentition, Occlusion, Oral Histology and Embryology**

1. Deciduous dentition.
2. Occlusion.
3. Supporting structures: periodontium.
4. Development of the orofacial complex.
5. Enamel, dentin, pulp and cementum.
6. Root formation and attachment apparatus.
7. Root morphology.
8. Eruption and exfoliation of teeth.

### **Head and Neck Anatomy**

1. Osteology of the skull, nasal cavity and sinuses.
2. Muscles of facial expression.
3. Muscles of mastication and hyoid.
4. Muscles of soft palate, pharynx, larynx.
5. Nervous system.
6. Cranial nerves.
7. Trigeminal nerve.
8. Autonomic nerves to the head and neck.
9. Arterial supply and venous drainage.
10. Lymphatic system.
11. Salivary glands.
12. Tongue.
13. Temporomandibular joint.
14. Neck.

## VI. Behavioral Objectives

At the end of each unit of study, the student is expected to:

### Descriptive Terms:

1. Define and locate all structures/terms related to the teeth and oral cavity for application to a clinical setting for a head and neck exam (intraoral and extraoral), dental charting, periodontal charting and provision of dental hygiene care.

### Facial Structures and Oral Cavity:

1. Describe the boundaries of the oral cavity and oropharynx and relate the importance of distinction for the purposes of documentation of findings.
2. Relate the structures of the oral cavity to their description or label for use in documentation during intraoral and extraoral examination, dental hygiene care and treatment:

|                            |                        |
|----------------------------|------------------------|
| Labia                      | Fordyce granules       |
| Buccal                     | Exostosis              |
| Tonsillar pillars          | Midpalatine raphe      |
| a. palatoglossal fold      |                        |
| b. palatopharyngeal fold   |                        |
| Fauces                     | Palatine rugae         |
| Oral pharynx               | Maxillary tuberosity   |
| Vestibule                  |                        |
| a. buccal vestibule        | Fovea palatine         |
| Oral cavity proper         | Incisive papilla       |
| Palatine tonsils           | Torus palatinus        |
| Pharyngeal adenoid tonsils | Uvula                  |
| Lingual tonsils            | Retromolar pad         |
| Lips                       | Filiform papilla       |
| Nasolabial groove          | Fungiform papilla      |
| Foliate papillae           | Circumvallate papilla  |
| Stensen's duct             | Lingual vein           |
| Parotid papilla            | Sublingual fold        |
| Plica fimbriata            | Median sulcus          |
| Marginal gingival          | Attached gingival      |
| Free gingival groove       | Palatine rugae         |
| Canine eminence            | Ptergomandibular raphe |
| Vermillion zone            | Lingual tonsils        |
| Philtrum                   | Lingual frenum         |
| Buccinator muscle          | Ankyloglossia          |
| Ramus of mandible          | Sublingual caruncle    |

|                           |                    |
|---------------------------|--------------------|
| Zygomatic arch            | Whartons duct      |
| Mucobuccal fold           | Mandibular tori    |
| Alveolar mucosa           | Intrinsic muscle   |
| Gingiva                   | Extrinsic muscle   |
| Stippled                  | Mylohyoid muscle   |
| Gingival margin           | Labial frenum      |
| Interdental papillae      | Buccal frenum      |
| Mucogingival junction     | Labiomental groove |
| Tubercle of maxillary lip | Vermillion border  |
| Tragus                    | Auricle            |
| Labial commissure         | Nares              |
| Ala                       | Lateral canthus    |
| Medial canthus            | Lacrimal duct      |
| Labial mucosa             | Buccal mucosa      |

3. Identify the structures of the oral cavity clinically.
4. List the structures found on the ventral and dorsal surface of the tongue.
5. Describe normal gingiva including its component parts.
6. Name the structures that lie under the sublingual folds and use in evaluating the area during examination.
7. List and describe the two areas of the oral cavity (oral cavity vs. oropharynx).
8. Explain why it is necessary to recognize normal oral anatomy, including references to *anomaly* versus *pathology* and medicolegal documentation.

### Osteology of Skull, Nose, Nasal Cavity and Paranasal Sinuses:

The following objectives should be met with the understanding of their use in documentation during intraoral and extraoral examination, dental hygiene care, radiographic evaluation and use in treatment documentation.

1. Identify all parts of a human skull on a model or diagram.
2. Describe the location of all bones in the skull.
3. Identify the two major divisions of the skull, describe the difference between them and list the bones included in each.
4. Identify and differentiate between suture, canal, fissure and foramen.
5. Identify the major difference between a suture in a newborn and an adult.
6. Identify the four bones visible from the superior aspect of the skull.
7. Identify the three sutures visible from the superior aspect of the skull.
8. Describe what the term process of a bone.
9. Recognize that the nasal conchae are the same as the turbinates.

10. Identify what bone forms the conchae.
11. Identify where the paranasal sinuses drain.
12. Identify the parts of the nasal septum.
13. Identify what makes up the zygomatic arch or cheekbone.
14. Explain the alveolar process.
15. Name of the bone of the skull that is freely movable.
16. Identify the location of the mental foramen.
17. Identify the bones that form the hard palate.
18. List the two sutures of the hard palate and the three foramina.
19. Identify the three subdivisions of the cranial cavity.
20. Identify the gland that rests in the hypophyseal fossa.
21. Identify the four pairs of paranasal sinuses and their locations.
22. Explain why the maxillary sinus is important to dentistry.
23. Explain why an infection of the sphenoid or ethmoid sinus is dangerous.
24. Identify the nasolacrimal duct.

### **The Tooth—Function and Terms:**

The following objectives should be met with the understanding of their use in documentation during intraoral and extraoral examination, dental hygiene care and use in treatment documentation.

1. Define and/or locate the following terms/structures:
  - a. Mastication.
  - i. Deglutition.
  - b. Cementoenamel junction.
  - c. Cervical line.
  - d. Anatomical crown.
  - e. Anatomical root.
  - f. Clinical crown.
  - g. Clinical root.
  - h. Eruption.
  - i. Root apex.
  - j. Alveolar process.
  - k. Alveolus.
  - l. Maxillary teeth.
  - m. Mandibular teeth.
  - n. Enamel.
  - o. Dentin.
  - p. Dentinoenamel junction.
  - q. Primary dentin.
  - r. Secondary dentin.
  - s. Reparative dentin.
  - t. Cementum.
  - u. Cellular cementum.

- v. Acellular cementum.
  - w. Pulp cavity.
  - x. Pulp chamber.
  - y. Pulp canal (root canal).
  - z. Pulp horns.
  - aa. Midroot axis.
  - bb. Long axis.
  - cc. Midline.
2. Discuss the importance of teeth.
  3. Label a drawing or a model with the four basic tooth tissues.
  4. Differentiate the clinical crown/root from the anatomical crown/root.
  5. List three root forms.
  6. Differentiate between maxillary and mandibular teeth.
  7. List and discuss four types of tissue that make up the tooth.
  8. Discuss why dentin formation can continue throughout life but enamel cannot.
  9. List and discuss the types of dentin and cementum.
  10. Describe the functions of cementum.
  11. State the functions of the pulp.
  12. Label the parts of the pulp cavity.
  13. Describe an odontoblast, cementoblast, cementocyte and cementoclast.
  14. List the four basic tooth types.
  15. Label a drawing or identify on a model the following:
    - a. Cementoenamel junction (CEJ).
    - b. Dentinoenamel junction (DEJ).
    - c. Apex.
    - d. Cervical line.
    - e. Alveolar process.
    - f. Alveolus.
    - g. Alveolar bone.
  16. Understand Universal numbering and the complete (DAQT) name (D-Dentition, A-Arch, Q-Quadrant, T-Tooth type), all anterior and posterior teeth in the adult (permanent) and primary dentitions.
  17. Name the surfaces of any tooth.
  18. Describe the division of surfaces of a tooth.
  19. Describe the line angles of a tooth.
  20. Describe the point angles of a tooth.
  21. Define the following terms and identify them on a model:
    - a. Developmental lobes.
    - b. Developmental grooves.
    - c. Tubercles.
    - d. Fossa.

- e. Pit.
  - f. Cusp.
  - g. Cusp ridge.
  - h. Marginal ridge.
  - i. Concavity.
  - j. Convexity.
  - k. Cingulum.
  - l. Mamelon.
  - m. Triangular ridge.
  - n. Transverse ridge.
  - o. Oblique ridge.
22. Name the number of lobes from which a tooth develops.

### **Fundamental Curvatures:**

The following objectives should be met with the demonstration of their use in assessing, describing and evaluating periodontal status.

1. Define height of contour (crest of curvature) and explain its function.
2. Define:
  - a. Alignment.
  - b. Contact area.
  - c. Interproximal spaces.
  - d. Interdental papilla.
  - e. Embrasure (spillway).
  - f. Cervical embrasure.
3. State the purpose of a contact area.
4. Describe what happens to cause a cervical embrasure.
5. Name embrasures according to their locations.
6. Give generalized locations of contact areas.
7. Describe the locations of the facial and lingual contours.
8. Describe the locations of the facial and lingual height of contour for anterior and posterior teeth.
9. Discuss the importance of restoring proper contours in restorative dentistry.
10. Discuss marginal ridge levels of adjacent teeth.

### **Dentition:**

The following objectives should be met with the understanding of their use in documentation during intraoral and extraoral examination, dental hygiene care and use in treatment documentation.

1. Describe or define the following terms:
  - a. Dentition.
  - b. Deciduous (primary).
  - c. Permanent (secondary).
  - d. Arches.
  - e. Maxillary arch.
  - f. Mandibular arch.
  - g. Quadrant.
  - h. Midline (midsagittal plane).
  - i. Succedaneous.
  - j. Nonsuccedaneous.
  - k. Mixed dentition.
2. Classify teeth according to:
  - a. Dentition: primary, permanent and mixed.
  - b. Arch: maxillary and mandibular.
  - c. Quadrant: right and left.
  - d. Type: incisors, canines, premolars and molars.
3. State the number and types of teeth in the primary and permanent dentition.
4. Discuss different systems for numbering permanent and primary teeth.
5. Use proper terminology when discussing teeth.
6. Name any tooth:
  - a. By its proper name (DAQT).
  - b. By the Universal Numbering System.
  - c. By the Palmer system.
7. Identify a tooth on a model or patient when given its number (Universal or Palmer).

#### **Maxillary Central Incisor:**

1. Name the eruption date of the maxillary central incisor.
2. Describe when the root is completed for this tooth.
3. Locate the developmental grooves and mamelons on a maxillary central incisor.
4. Give the Universal number and Palmer notation.
5. Describe the geometric shape of this tooth from the facial and lingual aspects.
6. Name the widest anterior tooth mesiodistally.
7. Compare the length and width of the maxillary central incisor from its labial aspect.
8. Contrast the mesial incisal angle and the distal incisal angle when viewed from the facial aspect.
9. Define mamelon and explain why we usually don't see them in adults.

10. Describe where, in which direction and why you would expect to find wear on this tooth.
11. Give two other names for developmental grooves and locate them on this tooth.
12. Identify developmental depressions and imbrication lines on this tooth.
13. Describe the lingual fossa and name its four borders.
14. Match the term cingulum with its definition and point it out on this tooth.
15. Describe where one would expect to find a lingual pit.
16. Describe where the incisal edge lies with respect to the facial-lingual root bisector.
17. Describe how many lobes develop this tooth.
18. Compare the mesial contour and distal contour.
19. Describe the root of this tooth with respect to:
  - a. Number.
  - b. Shape.
  - c. Straight or curved.
  - d. Root canal.

**Maxillary Lateral Incisor:**

1. Name the eruption date of the maxillary laterals.
2. Describe when the root is completed on this tooth.
3. Describe how many lobes develop this tooth.
4. Give the Universal number and Palmer notation.
5. Describe the arch position of the lateral.
6. Compare the general form of a maxillary central and lateral with respect to:
  - a. Size of crown.
  - b. Root length.
  - c. Roundness.
  - d. Convexities and concavities.
7. Name the permanent tooth that has greater variation in form than any other permanent tooth (except for third molars).
8. Compare the mesial incisal angle and distal incisal angle.
9. Locate the developmental grooves and imbrication lines.
10. Compare the lingual fossa and cingulum of the lateral with the central.
11. Locate and describe the lingual pit and linguogingival groove.
12. Describe the root with respect to:
  - a. Number.
  - b. Length in comparison to central.
  - c. Curvature.
  - d. Root canal.



13. Name which tooth is more likely to have a lingual pit—maxillary central or lateral.
14. Name the tooth that has a linguogingival groove.
15. Discuss the incisal edge's relationship to the long axis of the tooth.

**Mandibular Central Incisor:**

1. Name the eruption date of the mandibular incisors.
2. Describe when the root is completed on this tooth.
3. Give the Universal number and Palmer notation.
4. Describe the arch position.
5. Name the smallest tooth in the permanent dentition.
6. Name the tooth that is bilaterally symmetrical.
7. Describe the geometric shape of the facial aspect.
8. Give the location of the height of contour of the facial and lingual surfaces.
9. Describe the distal incisal angle and the mesial incisal angle.
10. Discuss the incisal edges relationship with the long axis of the tooth.
11. Describe the imbrication lines and developmental depressions, if present.
12. Describe the lingual fossa and compare it with the maxillary incisors.
13. Discuss the incisal edge's relationship to the root.
14. Describe the slope that the incisal edge will take due to incisal wear.
15. Describe the root with respect to:
  - a. Number and shape.
  - b. Number of root canals.
  - c. Location of flutes.

**Mandibular Lateral Incisor:**

1. Name the eruption date of this tooth.
2. Describe when one would expect the root to be fully developed.
3. Describe the number of lobes from which this tooth develops.
4. Give the Universal number and Palmer notation.
5. Describe the arch position of the mandibular lateral incisor.
6. Compare the size of this tooth to the size of the mandibular central and describe why it is larger.
7. Contrast the lingual aspect with the lingual aspect of the mandibular central.
8. Describe the incisal edge's relationship to the long axis of the tooth.

9. Discuss the appearance of this tooth when viewed from the incisal and compare this with the incisal view of the mandibular central incisor.
10. Describe the root with respect to its:
  - a. Number.
  - b. Root canals.
  - c. Fluting.

**Incisors:**

1. Rank the four incisors in order of size.
2. Compare the lingual development of the four incisors.
3. Compare and contrast mesial and distal incisal corners.
4. Describe the incisal edge with respect to the long axis of the four incisors.
5. Compare the curvatures of the mesial and distal cervical line.
6. Describe the direction that the incisal wear pattern will slope (facially or lingually).
7. Name the incisor that would most likely have a lingual pit.
8. Name the incisor that may have a linguogingival groove.
9. Name the incisor that is bilaterally symmetrical.
10. Name the incisor that looks twisted on its root from the incisal view.
11. Name the incisor with the least anatomy.
12. Name the incisors that are most likely to have mamelons.
13. Name the tooth that has the smallest crown in the entire dentition.
14. Identify any incisor from its picture, model or actual tooth.

**Permanent Canines:**

1. Give two names for this tooth.
2. Define the common name for the canine.
3. List the functions of the canines.
4. Name the tooth that the canines most resemble from the facial aspect.
5. Describe the arch position of this tooth.
6. Discuss the importance of these teeth in overall facial structure.
7. Name the longest permanent tooth in the arch.
8. Describe the canine eminence.
9. Name the eruption dates of the maxillary and mandibular canines.
10. Describe when the root is completed on this tooth.
11. Name how many lobes form these teeth.
12. Give the Universal number and Palmer notation.
13. Name the arch position of these teeth.
14. Describe the shape when viewed from the proximal and facial aspects.

15. Name which lobe is the best developed on the facial and on the lingual surfaces.
16. Locate the imbrication lines and developmental grooves on the facial surface.
17. Describe the cingulum.
18. Identify the lingual cusp ridge, marginal ridges, fossae and cingulum.
19. Describe the location of the cusp tip relative to the long axis of the tooth.
20. Contrast the mesial and distal halves of the tooth when viewed from the incisal.
21. State where the wear should be located and give the rationale for this position.
22. Describe the root with respect to:
  - a. Number.
  - b. Root canal.
23. Compare the lingual development of the maxillary and mandibular canine.
24. Name the anterior tooth that has the most probability of having two roots.
25. Identify a maxillary and mandibular canine when given a model or actual canine.
26. Compare and contrast the maxillary and mandibular canines with respect to:
  - a. Lingual development.
  - b. Cusp tip/root bisector/long axis.
  - c. Wear pattern.

**Premolars:**

1. Name the number of premolars in the permanent dentition.
2. Describe the arch position of the premolars.
3. Name the number of premolars in each quadrant.
4. Identify two names for this tooth.
5. List the functions of the premolar.
6. Describe the various forms of the premolar.
7. Explain what is meant by the term *succedaneous* and identify the teeth that the premolars replace by complete name or Universal number.
8. Compare and contrast the maxillary and mandibular premolars with respect to:
  - a. Facial and lingual cusp size.
  - b. Proximal view: inclination of the crown.
  - c. Occlusal view: width faciolingually and mesiodistally.
  - d. Size and shape of the first and second premolars.

- e. Number of roots.
- f. Developmental grooves: mesial maxillary first premolar and perio.

#### **Permanent Molars:**

1. Identify the number of permanent molars in the adult dentition.
2. Name the arch position for the permanent molars.
3. Discuss that the permanent molars are nonsuccedaneous.
4. List the functions of the molars.
5. Discuss how the molars differ from other teeth in the permanent dentition.
6. List five differences between the maxillary and mandibular molars.

#### **Tooth Identification:**

The following objectives should be met with the understanding of their use in documentation during intraoral and extraoral examination, dental hygiene care and use in treatment documentation.

1. For each tooth in the permanent dentition, provide the following information:
  - a. Universal and Palmer notation number.
  - b. Eruption date.
  - c. Description from all views.
  - d. Locations of heights of contour—facial and lingual.
  - e. Number of roots.
  - f. Relative size of roots of a tooth.
  - g. Shape of pulp cavity.
  - h. Number and location of root canals.
  - i. Common anomalous forms.
  - j. Distinguishing characteristics.
2. Describe the shape of the cervical line for all permanent teeth in general terms from anterior to posterior.
3. Compare and contrast teeth of the permanent dentition.
3. Identify permanent teeth using drawings, models and natural teeth.
4. Identify the tooth with the:
  - a. Longest mesial to distal surface.
  - b. Longest trunk from CEJ to furcation.
  - c. Smallest crown from CEJ to incisal edge.
  - d. Longest root.
  - e. Most likelihood of having a bifurcated root.

### **Deciduous Dentition:**

The following objectives should be met with the understanding of their use in documentation during intraoral and extraoral examination, dental hygiene care (including parent and patient education) and use in treatment documentation.

1. Give the four names for baby teeth.
2. Describe the teeth that make up the primary dentition.
3. Define exfoliation.
4. List the eruption sequence and approximate date of eruption of primary teeth.
5. Describe the differences between permanent and primary teeth.
6. Explain why it is important to keep primary teeth healthy.
7. Identify a primary tooth by its description, picture, model or actual tooth.
8. Describe root resorption.

### **Occlusion:**

The following objectives should be met with the understanding of their use in documentation during intraoral and extraoral examination, dental hygiene care (including treatment planning) and use in treatment documentation:

1. Describe the following terms as they pertain to tooth relationships:
  - a. Occlusion.
  - b. Centric occlusion.
  - c. Centric relation.
  - d. Vertical dimension of rest.
  - e. Curve of Spee.
  - f. Curve of Wilson.
  - g. Mesiognathic.
  - h. Retrognathic.
  - i. Prognathic.
  - j. Malocclusion.
  - k. Alignment.
  - l. Tongue thrust.
  - m. Protrude.
  - n. Retrude.
  - o. Intercuspatation.
  - p. Mesial drift.
  - q. Mesio-occlusion.
  - r. Disto-occlusion.
  - s. Primate space.
  - t. Leeway space.
  - u. Mesial step.
  - v. Distal step.
  - w. Flush terminal plane.
2. Discuss the idea that teeth are in equilibrium between the tongue, lips and cheeks.
3. Describe the direction in which teeth tend to drift.
4. Recognize the following on models, in pictures or on a patient:
  - a. Anterior crossbite.
  - b. Posterior crossbite.

- c. Edge-to-edge.
  - d. End-to-end.
  - e. Open bite.
  - f. Overjet (normal, increased or decreased).
  - g. Overbite (normal, increased or decreased).
  - h. Deep bite.
5. Classify occlusion on a patient according to Angle's classification, molar and canine, and associate each classification with the probable facial profile.

### **The Periodontium:**

The following objectives should be met with the understanding of their use in documentation during intraoral examination, dental hygiene care and use in treatment documentation.

- 1. Describe the periodontium.
- 2. Define and identify the following anatomical features of the oral mucosa:
  - a. Free gingiva.
  - b. Attached gingiva.
  - c. Alveolar mucosa.
  - d. Free gingival sulcus.
  - e. Interdental papilla.
  - f. Free gingival groove.
  - g. Free gingival margin.
  - h. Mucogingival line.
  - i. Col area.
- 3. Describe healthy gingival tissue by its morphological characteristics.
- 4. Describe Sharpey's fibers.
- 5. List the three parts of the attachment unit.
- 6. Name the two types of cementum and describe where each is found.
- 7. Describe the following terms and their locations:
  - a. Alveolar process.
  - b. Alveolus.
  - c. Alveolar bone proper.
  - d. Compact bone.
  - e. Spongy bone.
  - f. Alveolar crest.
  - g. Cribiform plate.
  - h. Interdental bone.
  - i. Interradicular bone.
  - j. Cortical plate.

8. Describe bone as an active, living tissue and its associated cells.
9. Describe the functions of the periodontal membrane (PDM).
10. Compare and contrast the compact and trabecular bones and give other terms for each.
11. Describe the lamina dura and recount when the term is used.
12. Label a diagram of the gingival and periodontal ligament fiber groups and give the composition and function of each.
13. Name which areas of the gingiva are keratinized and nonkeratinized.

### Development of Orofacial Complex:

The following objectives should be met with the understanding of their use in documentation during intraoral and extraoral examination, dental hygiene care and use in treatment documentation:

1. Discuss the difference between *cephalic* and *caudal*.
2. List the three germ layers and describe what structure they give rise to.
3. Discuss the difference between the period of the ovum, embryo and fetus.
4. Describe how and when the mouth is formed using the following terms:
  - a. Stomodeum.
  - b. Buccopharyngeal membrane.
5. Describe the following terms including their location:
  - a. Frontal process.
  - b. Branchial arches.
  - c. Branchial arch I and II.
  - d. Maxillary process.
  - e. Mandibular arch.
  - f. Medial nasal process.
  - g. Lateral nasal process.
  - h. Globular process.
  - i. Lateral palatine processes.
  - j. Premaxilla.
  - k. Foramen caecum.
  - l. Thyroglossal duct.
  - m. Rathkes pouch.
  - n. Philtrum.
6. Explain clefts as a failure of fusion of embryonic parts.
7. Describe macrostomia.
8. Describe the formation of the palate and name what teeth are in which part.
9. Discuss clefts of lip and palate.

10. Explain why the tongue has so many innervations.
11. Discuss how the maxillary process is a budding off of the mandibular arch.
12. Discuss the fusion of the palate.
13. Describe how the embryo develops from a mass of cells to a tubular embryo.

### Enamel, Dentin and Pulp:

The following objectives should be met with the understanding of their use in documentation during intraoral examination, dental hygiene care (especially caries risk assessment, nutritional counseling and patient education), dental treatment planning, radiographic evaluation and use in treatment documentation.

1. Identify the following terms with their description or on a diagram:

|                              |                            |
|------------------------------|----------------------------|
| a. Dental lamina.            | n. Intertubular dentin     |
| b. Enamel organ.             | o. Primary dentin.         |
| c. Bud, cap and bell stages. | p. Secondary dentin.       |
| d. Outer enamel epithelium.  | q. Reparative dentin.      |
| e. Inner enamel epithelium.  | r. Dead tracts.            |
| f. Stellate reticulum.       | s. Sclerotic dentin.       |
| g. Dental papilla.           | t. Preameloblasts.         |
| h. Dental sac.               | u. Hydroxyapatite crystal. |
| i. Ameloblasts.              | v. Imbrication line.       |
| j. Odontoblasts.             | w. Hypocalcified enamel.   |
| k. Enamel rod.               | x. Hypoplastic enamel.     |
| l. Dentinal tubule.          | y. Pulp stones.            |
| m. Peritubular dentin.       |                            |
2. Describe the dental lamina, name when it begins to form and explain the embryonic germ layer from which it originates.
3. Describe the dental papilla and name the embryonic layer from which it develops.
4. Discuss the bud, cap and bell stages of tooth development.
5. Describe a mesenchymal cell and list at least two cells it can become.
6. Name what the inner enamel epithelial cells differentiate into in the bell stage.
7. Describe what the odontoblasts do when they come in contact with the preameloblasts.
8. Describe the stellate reticulum.
9. Describe matrix formation and crystallization of dentin (apposition and calcification).
10. Name which forms first—enamel or dentin.



11. Name where on the tooth that apposition and calcification begins.
12. Identify the location of succedaneous and nonsuccedaneous dental lamina.
13. Describe the percent organic and inorganic material in enamel and dentin.
14. Describe the alignment of enamel rod and dentinal tubule with respect to the DEJ or DCJ.
15. Explain the development of enamel.
16. Name the two stages of calcification of the enamel rod and describe the process of each.
17. Discuss hypocalcification and how it differs from demineralization.
18. Describe the composition of dentin.
19. Compare and contrast primary, secondary, reparative and sclerotic dentin.
20. Discuss the circumstances under which reparative dentin is made.
21. Describe what happens to odontoblasts in the area of a cavity preparation.
22. Describe where one would find odontoblasts in the pulp cavity.
23. Describe the sensations generated by the pulp.
24. Compare and contrast the young versus the old pulp.

#### **Root Formation and Attachment Apparatus:**

The following objectives should be met with the understanding of their use in dental hygiene care and in treatment documentation.

1. Describe the formation of a root.
2. Describe the epithelial rests of Malassez.
3. Describe enamel pearls and their clinical significance.
4. Discuss cementum with respect to:
  - a. Composition and where it is the thickest.
  - b. Where it begins formation.
  - c. Cementum/enamel relationships.
  - d. Sharpeys fibers.
  - e. Hypercementosis.
  - f. Arrange the contents of the periodontal space from deep to superficial.
7. Name the direction of the curvature of the CEJ on all surfaces of all teeth.
8. Describe where one might expect to find fluting and furcation areas.

### **Eruption and Shedding of Teeth:**

The following objectives should be met with the understanding of their use in documentation during intraoral examination, dental hygiene care, treatment documentation, radiographic evaluation and patient/parent education.

1. List and describe the three stages of eruption.
2. Define attrition.
3. Describe shedding of the primary dentition.
4. Discuss reasons for retained primary teeth.

### **Temporomandibular Joint (TMJ):**

The following objectives should be met with the understanding of their use in documentation during intraoral and extraoral examination, dental hygiene care and use in treatment planning and documentation.

1. Describe the structure of the TMJ.
2. Discuss the TMJ as a hinge/glide joint using the ideas of rotation and translation.
3. Describe the osteology of the joint.
4. Describe the articular disc, the synovial cavities and capsule and the temporomandibular ligament.
5. Explain the movement of the TMJ.
6. List various TMJ problems and possible treatment options.

### **Muscles of Facial Expression:**

The following objectives should be met with the understanding of their use in documentation during intraoral and extraoral examination, dental hygiene care and use in treatment documentation.

1. List the two groups of muscles of the head.
2. Describe the innervation, origin, insertion and action of the muscles of mastication and the muscles of facial expression.
3. Identify the terms related to a muscle or a picture of that muscle.
4. Interpret the name of any muscle by explaining the meaning of such terms as:

|             |        |                   |
|-------------|--------|-------------------|
| mastication | anguli | raphe             |
| oculi       | oris   | pterygomandibular |
| orbicular   | labii  | depressor         |
| levator     | nasi   | epicranium        |
5. Describe the buccinator and the mentalis muscles.

### **Muscles of Mastication, Hyoid and Sternocleidomastoid (SCM):**

The following objectives should be met with the understanding of their use in documentation during intraoral and extraoral examination, dental hygiene care and use in treatment documentation.

1. Discuss the following terms:
  - a. Origin.
  - b. Insertion.
  - c. Action.
2. List the four muscles of mastication.
3. Describe the innervation of the muscles of mastication.
4. List the origin, insertion and action of any muscle of mastication.
5. List the muscles that form a sling for the mandible.
6. Discuss the hyoid bone and its location.
7. List the function of the hyoid muscles.
8. List the suprahyoid and infrahyoid muscles.
9. Identify the muscle that makes up the floor of the mouth.
10. Discuss the origin and insertion of the following muscles:
  - a. Mylohyoid.
  - b. Geniohyoid.
  - c. Digastric.
  - d. Sternocleidomastoid.
11. Identify the following muscles:
  - a. Medial pterygoid.
  - b. Lateral pterygoid.
  - c. Masseter.
  - d. Temporalis.
  - e. Mylohyoid.
  - f. Digastric.
  - g. Sternocleidomastoid.

### **Soft Palate, Pharynx and Larynx:**

The following objectives should be met with the understanding of their use in documentation during intraoral and extraoral examination, dental hygiene care and use in treatment documentation.

1. Identify the geographical boundaries of the soft palate, pharynx and larynx.
2. Discuss the function of the soft palate muscles.
3. List the three divisions of the pharynx.
4. Give another name for the pharynx.
5. Give another name for the pharyngeal tonsils and differentiate them from the palatine tonsils.

6. Name the structure between the fauces.
7. Identify the location of the vocal folds.
8. Discuss the epiglottis and its actions during breathing and swallowing.
9. Discuss the larynx with respect to its location, purpose and structure inside.

### **Cranial Nerves:**

Where applicable, the following objectives should be met by explaining the meanings of the terms and relating their importance to the various structures of the head and neck anatomy and their functions.

1. Discuss what afferent, efferent, motor and sensory nerves mean.
2. List the twelve cranial nerves, their name and number.

### **Trigeminal Nerve:**

Where applicable, the following objectives should be met by explaining the meanings of the terms and relating their importance to the various structures of the head and neck anatomy and their functions.

1. List the general structures innervated by the sensory and motor branches of the trigeminal nerve.
2. Give another name for the trigeminal nerve.
3. Discuss what is meant by the phrase that a nerve is sensory to an area of the body.
4. Describe the three branches off the semilunar ganglion and describe whether they are sensory, motor or both.
5. Label the three branches of the trigeminal nerve given a drawing.
6. Describe the area innervated by each branch of the trigeminal nerve.
7. Name the foramina that each branch of the trigeminal must pass through to get out of the cranium.
8. Name the general innervation of each of the following:
  - a. Upper eyelid, forehead and lacrimal gland.
  - b. Upper lid, lower eyelid and cheek.
  - c. Lower jaw.
9. Name the specific nerve that innervates these structures and their associated soft tissues by explaining the significance of understanding these relationships for use in delivering local anesthesia during dental hygiene and dental care:
  - a. Maxillary molars.
  - b. Mandibular incisors and canines.
  - c. Maxillary premolars.

- d. Lingual gingiva of the mandibular teeth.
- e. Mandibular molars.
- f. Maxillary incisors and canines.
- g. Soft palate.
- h. Posterior two thirds of the hard palate.
- i. Facial gingiva of the mandibular molars.
- j. Mandibular premolar.
- k. Facial gingiva of the mandibular incisors.
- l. Facial gingiva of the mandibular canines.
- m. Facial gingiva of the mandibular premolars.
- n. Facial gingiva of the maxillary incisors.
- o. Facial gingiva of the maxillary canines.
- p. Facial gingiva of the maxillary premolars.
- q. Facial gingiva of the maxillary molars.

### **Autonomic Nerves to the Head and Neck:**

The following objectives should be met by demonstrating an understanding of the implications to providing dental hygiene care.

- 1. Discuss the primary responsibility of the autonomic nervous system (ANS).
- 2. Discuss the ANS in terms of afferent or efferent and sensory or motor.
- 3. List the two divisions of the nervous system (central nervous system [CNS] and peripheral nervous system [PNS]).
- 4. Discuss the fact that the ANS is part of the PNS.
- 5. List the two divisions of the ANS and the area of the body from which they originate.
- 6. Discuss the opposite effect of the sympathetic and parasympathetic systems.
- 7. List the properties of the somatic and autonomic nervous systems.
- 8. Discuss the general functions of the sympathetic and parasympathetic innervation on heart rate, respiratory rate, etc.

### **Arterial Supply and Venous Drainage:**

The following objectives should be met by demonstrating an understanding of the implications to providing dental hygiene care:

- 1. Trace the flow of blood from the heart into the head and neck.
- 2. List the two divisions of the common carotid artery.
- 3. List the two branches of the external carotid artery that supply the entire dentition and oral cavity.

4. Explain where the blood supply to the muscles of mastication originates.
5. Name the individual vessels that supply all areas of the oral cavity.
  - a. Tongue (lingual artery).
  - b. Floor of the mouth (lingual artery).
  - c. Lower teeth and gingiva (dental and alveolar artery).
  - d. Muscles of mastication (maxillary artery).
  - e. Hard palate (anterior and posterior).
  - f. Sphenoplatine/greater palatine).
  - g. Upper teeth and gingiva (dental and alveolar artery).
6. Name the major vein that drains most of the head and neck.
7. Discuss the pterygoid plexus of veins and its significance.
8. Explain the meaning of the following words:
  - a. Anastomose.
  - b. Plexus.
9. Name the major artery that goes to the brain.
10. List the major artery that goes to the face and neck.
11. Name the artery that goes to the tooth, gingiva and PDL.

### **The Lymphatic System:**

The following objectives should be met by demonstrating an understanding of the implications to providing dental hygiene care and dental care. This demonstration should include the ability to explain and educate the patient about specific findings revealed during intraoral and extraoral examination and radiographic findings.

1. Discuss the lymphatic system and its function.
2. Define the term lymph and its components.
3. Describe three functions of the lymph nodes and describe their size.
4. Describe Waldeyer's Ring.
5. Discuss the composition of lymph.
6. Discuss lymph capillaries, vessels and ducts.
7. List the two lymph ducts and describe the quadrants they drain.
8. List and locate the four main groups of lymph nodes of significance to dentistry.
9. Describe in general terms where you would expect to feel lymph nodes on the head and neck region during an extraoral exam.
10. Compare and contrast the spread of infection via the lymph system and fascial planes.
11. Define fascial spaces or planes.
12. Given an abscessed tooth, describe where one would expect infection to spread and the danger of not treating such an infection.

13. Discuss how an extracranial infection can go intracranially.
14. List warning signs of cavernous sinus infection.
15. Define cutaneous abscess.

### **Salivary Glands:**

The following objectives should be met by demonstrating an understanding of the implications to providing dental hygiene care (especially as it relates to caries risk assessment) and dental care. This demonstration should include the ability to explain and educate the patient about specific findings revealed during intraoral and extraoral examination and radiographic findings.

1. Describe the function of salivary glands.
2. Briefly review the components of saliva.
3. Discuss the normal amount of saliva that is produced each day.
4. Name the largest salivary gland.
5. List the locations of the three major salivary glands and name their ducts.
6. Discuss what effect parasympathetic and sympathetic stimulation has on glandular secretion.
7. Identify the salivary glands with their description or on a diagram.
8. Describe where lesser salivary glands are located.
9. Name two other terms that refer to the lesser salivary glands.
10. Name the percentage of saliva produced by each gland.
11. Name the function of minor salivary glands.
12. Describe the glands of Blandin and Nuhn and glands of Von Ebner.

### **Tongue:**

The following objectives should be met with an understanding of their use in documentation during intraoral and extraoral examination, dental hygiene care and use in treatment documentation.

1. Discuss the composition of the tongue.
2. Explain why the anterior two-thirds and posterior one-third of the tongue have different appearances and innervation and different taste sensations.
3. Contrast the appearance of the dorsal and ventral surfaces of the tongue.
4. List the two types of muscles of the tongue.
5. List the four extrinsic muscles.
6. Discuss the innervation of the tongue.

## **Neck:**

The following objectives should be met with an understanding of their use in documentation during intraoral and extraoral examination, dental hygiene care and use in treatment documentation.

1. List the following structures from superficial to deep: platysma, SMA, thyroid gland, trachea, esophagus and carotid sheath.
1. Identify the triangles of the neck and structures they contain.

## **VII. Sequencing**

Ideally, because of the relevance of the material contained in orofacial anatomy to subsequent coursework, this subject matter should be presented as early as possible in the dental hygiene curriculum.

## **VIII. Faculty**

Faculty with appropriate advanced education in the subject areas, experience and interest in the topic of orofacial anatomy are mandatory for this curriculum. Faculty should have background in educational methods, testing and measurement, and evaluation.

## **IX. Facilities**

Facilities should include a laboratory with the equipment and appropriate materials and supplies (e.g., models, study casts, charts, radiographs, extracted teeth, etc.) to ensure adequate instruction in order to meet the stated objectives.

## **X. Occupational Hazards**

Care must be taken with the chemicals used in preparation and handling of the extracted teeth specimens. Students should know principles of infection control prior to handling extracted teeth.

## **XI. Educational Strategies**

Educational strategies for distance/online learning or within a learning management system, for oral and facial anatomy, can include but are not limited to:

- 3-D images of tooth morphology and the structures of the head and neck that are available as part of a textbook package or that can be obtained separately.
- Interactive labelling exercises.



- Online message boards for discussion of key ideas, student interaction on areas of common misunderstanding or difficulty, and solicitation from students of difficult points or subjects that can then be reviewed, especially in a hybrid delivery situation.
- Review questions and answers.
- Post online tutorials to YouTube, but only provide links after instructor has reviewed and approved.

## **XI. Bibliography**

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## Oral Pathology

### I. Introduction

Pathology is that portion of the dental hygiene curriculum that deals with the understanding of disease processes. It includes the basic principles of disease and their application to specific organ systems. Pathology prepares students to detect deviations from normal in the evaluation of the patient's systemic and oral health status and to make appropriate referrals when patients exhibit deviations that require a definitive diagnosis.

#### Definitions:

- A. **General Pathology:** The branch of biologic science that deals with the nature of disease, its causes, its processes and its effects, together with associated alterations of structure and function.
- B. **Oral Pathology:** The branch of biologic science that deals with the etiology, pathogenesis, identification and management of diseases, which affect the oral and maxillofacial regions.
- C. **Diagnosis:** The identification of a specific disease. The diagnostic process includes: clinical identification, radiographic interpretation, historical data, laboratory studies, surgical intervention, therapeutic application and the differential diagnosis.

### II. Interrelationships

In the dental hygiene curriculum, pathology integrates both basic and dental sciences and is a significant component of clinical dental hygiene courses. An understanding of pathophysiology requires knowledge of normal anatomy and physiology and microbiology as well as histology and embryology related to the head and neck region. These are essential to understanding clinical manifestations and treatment of oral and systemic diseases. In addition, pathology is directly related to periodontics, nutrition, dental radiology and the clinical dental hygiene courses in which students collect and interpret data, study disease transmission and formulate dental hygiene diagnoses and treatment plans. The knowledge gained from the pathology portion of a dental hygiene curriculum enables the student to understand the delivery in the clinical setting and participate comprehensively in the delivery of health care.

The design of a curriculum in pathology for dental hygiene students will vary in different academic settings. Subject matter may be under the aegis

of a single department or may draw upon the experience and expertise of multiple departments. The components of oral and general pathology may be addressed in one core program or integrated into several courses throughout the curriculum. With current emphasis on the relationship between systemic diseases and oral health, it is recommended that a separate course on oral medicine be provided to address systemic pathology.

### **III. Overview**

Pathology in the dental hygiene curriculum includes general and oral pathology. General pathology should include an overview of basic disease processes, such as cellular adaptations, inflammation, neoplasia, immunology, allergies and wound healing. The oral pathology portion of the curriculum emphasizes recognition of oral diseases based on clinical signs and symptoms, including the concept of differential diagnosis. Although clinical and radiographic manifestations are significant, the curriculum should emphasize that the final diagnosis and treatment plan are based on collection and interpretation of information using a variety of diagnostic procedures.

### **IV. Primary Educational Goals**

At the completion of the courses in pathology, the student will be able to demonstrate, by both course objective and subjective examination, a knowledge of the language of pathology and a clear understanding of the etiology, pathophysiology and structural and functional alterations that result from the disease processes; knowledge of epidemiology; genetics; etiology; pathogenesis; clinical, radiographic, histologic and laboratory features; treatment; and prognosis of all conditions covered in the course curriculum.

The student should be able to demonstrate both by written exam and in the clinical setting the application of this information to the practice of dental hygiene.

Student assessment should include case simulations and studies or require the student to demonstrate through other means a working knowledge of oral pathology. Students should be able to distinguish between similar clinical conditions and be able to identify those conditions that require alteration of dental hygiene treatment.

To the extent possible, it is recommended that the instructional objectives involve the higher cognitive domains, including application to specific clinical problems and synthesis of new knowledge from basic principles.

## V. Prerequisites

Prerequisite courses should provide the students with a foundation in basic dental and clinical sciences. These should include the study of: anatomy and physiology, cellular biology, microbiology, biochemistry, oral/dental anatomy, radiology, oral histology and embryology and preclinical dental hygiene courses. In addition, biomedical science content in periodontics, nutrition and pharmacology may serve as prerequisites or corequisites to ensure an understanding of the fundamental structures, functions and interrelationships of the body systems.

Communication skills should be an integral component of the curriculum so that the student will be able to discuss findings with dental and other health care professionals as well as with the patient.

## VI. Core Curriculum Outline: General Pathology

- A. Disease at the cellular level.
  - 1. Causes of cell injury and cell death.
  - 2. Mechanisms of cell injury and cell death.
- B. Inflammation and repair.
  - 1. Causes of inflammation.
  - 2. Types of inflammation.
  - 3. Components of the inflammatory response.
    - a. Chemical mediators.
    - b. Hemodynamic changes.
    - c. Cellular changes.
  - 4. Regeneration and repair.
    - a. Types of healing.
    - b. Cellular changes.
    - c. Factors that influence wound healing.
    - d. Complications of wound healing.
- C. Disturbances in cell growth and neoplasia.
  - 1. Decreased growth.
    - a. Hypoplasia.
    - b. Atrophy.
  - 2. Increased growth.
    - a. Hyperplasia.
    - b. Hypertrophy.
    - c. Hamartoma.
    - d. Cyst.
    - e. Metaplasia.
    - f. Dysplasia.
  - 3. Neoplasia.
    - a. Classification.

- b. Nomenclature.
    - c. Clinical/histopathologic features.
  - 4. Carcinogenesis.
- D. Genetic derangements.
  - 1. Chromosomal abnormalities.
  - 2. Molecular changes and mutations.
  - 3. Inheritance patterns.
- E. Concepts of immunology.
  - 1. Immunocompetence.
  - 2. Humoral response.
  - 3. Cell-mediated immune response.
  - 4. Immunodeficiency.
  - 5. Hypersensitivity.
  - 6. Tolerance and autoimmunity.
  - 7. Allergy.
- F. Infectious diseases.
  - 1. Bacterial.
  - 2. Viral.
  - 3. Fungal.
  - 4. Parasitic.
  - 5. Emerging and re-emerging diseases.

## **VII. Core Curriculum Outline: Oral Pathology**

- A. Developmental disturbances of oral and maxillofacial region.
  - 1. Orofacial clefts.
  - 2. Commissural lip pits.
  - 3. Fordyce granules.
  - 4. Leukoedema.
  - 5. Microglossia.
  - 6. Macroglossia.
  - 7. Ankyloglossia.
  - 8. Lingual thyroid.
  - 9. Fissured tongue.
  - 10. Hairy tongue.
  - 11. Varicosities.
  - 12. Exostoses.
  - 13. Torus palatinus.
  - 14. Torus mandibularis.
  - 15. Developmental cysts.
- B. Abnormalities of teeth.
  - 1. Environmental alterations of teeth.
  - 2. Developmental alterations of teeth: number, size, shape, structure, color and eruption.

- C. Pulpal and periapical disease.
  - 1. Pulpitis.
  - 2. Periapical granuloma.
  - 3. Periapical cyst.
  - 4. Periapical abscess.
  - 5. Cellulitis.
  - 6. Osteomyelitis.
  - 7. Diffuse sclerosing osteomyelitis.
  - 8. Condensing osteitis (focal sclerosing osteomyelitis).
  - 9. Pulp calcification.
  - 10. Resorption.
- D. Infections.
  - 1. Bacterial.
  - 2. Viral.
  - 3. Fungal and protozoal.
- E. Physical and chemical injuries.
  - 1. Linea alba.
  - 2. Traumatic ulcerations.
  - 3. Electrical and thermal burns.
  - 4. Chemical injuries.
  - 5. Oral trauma from sexual practices.
  - 6. Amalgam tattoo.
  - 7. Reactive hyperplasia, i.e., gingival, denture-induced.
- F. Allergic and immunologic diseases.
  - 1. Recurrent aphthous stomatitis.
  - 2. Behcet's syndrome.
  - 3. Contact stomatitis.
  - 4. Angioedema.
  - 5. Drug reactions.
  - 6. Reiter's syndrome.
- G. Epithelial pathology.
  - 1. Squamous papilloma.
  - 2. Verruca vulgaris.
  - 3. Condyloma acuminatum.
  - 4. Seborrheic keratosis.
  - 5. Melanocytic nevus.
  - 6. Smokeless tobacco keratosis.
  - 7. Nicotine stomatitis.
  - 8. Squamous cell carcinoma.
  - 9. Verrucous carcinoma.
  - 10. Melanoma.
  - 11. Basal cell carcinoma.
- H. Salivary gland pathology.
  - 1. Mucocele.
  - 2. Ranula.

3. Sialolithiasis.
  4. Infectious sialadenitis.
  5. Necrotizing sialometaplasia.
  6. Xerostomia.
  7. Sjögren syndrome.
  8. Pleomorphic adenoma.
  9. Warthin tumor.
  10. Mucoepidermoid carcinoma.
  11. Acinic cell carcinoma.
  12. Malignant mixed tumors.
  13. Adenoid cystic carcinoma.
- I. Soft tissue cysts and tumors.
1. Fibroma.
  2. Epulis fissuratum.
  3. Inflammatory papillary hyperplasia.
  4. Pyogenic granuloma.
  5. Peripheral giant cell granuloma.
  6. Lipoma.
  7. Neurofibroma.
  8. Congenital epulis.
  9. Hemangioma.
  10. Lymphangioma.
  11. Kaposi's sarcoma.
  12. Rhabdomyosarcoma.
  13. Brachial cyst.
  14. Dermoid cyst.
  15. Thyroglossal tract cyst.
- J. Hematologic disorders.
1. Anemia.
  2. Sickle cell anemia.
  3. Neutropenia.
  4. Agranulocytosis.
  5. Thrombocytopenia.
  6. Leukemia.
- K. Bone pathology.
1. Osteogenesis imperfect.
  2. Cleidocranial dysplasia.
  3. Paget's disease of bone.
  4. Central giant cell granuloma.
  5. Fibrous dysplasia.
  6. Cemento-osseous dysplasia.
  7. Ossifying fibroma.
  8. Gardner syndrome.
  9. Mandibulofacial dysostosis.
  10. Cherubism.

- L. Odontogenic cysts and tumors.
  - 1. Dentigerous cyst.
  - 2. Eruption cyst.
  - 3. Primordial cyst.
  - 4. Odontogenic keratocyst.
  - 5. Lateral periodontal cyst.
  - 6. Gingival cysts.
  - 7. Ameloblastoma.
  - 8. Adenomatoid odontogenic tumor.
  - 9. Ameloblastic fibroma.
  - 10. Odontoma.
  - 11. Odontogenic myxoma.
  - 12. Cementoblastoma.
  - 13. Periapical cementosseous dysplasia.
- M. Nonodontogenic cysts and pseudocysts.
  - 1. Globulomaxillary.
  - 2. Nasolabial.
  - 3. Median mandibular.
  - 4. Nasopalatine canal.
  - 5. Static bone cyst (Stafne bone cyst, lingual mandibular bone concavity).
- N. Dermatologic diseases.
  - 1. Ectodermal dysplasia.
  - 2. White sponge nevus.
  - 3. Peutz-Jeghers syndrome.
  - 4. Ehlers-Danlos syndrome.
  - 5. Marfans syndrome.
  - 6. Pemphigus.
  - 7. Cicatrical pemphigoid.
  - 8. Bullous pemphigoid.
  - 9. Erythema multiforme.
  - 10. Lichen planus.
  - 11. Psoriasis.
  - 12. Lupus erythematosus.
  - 13. Systemic sclerosis.
  - 14. Petechiae, purpura and ecchymoses.
  - 15. Telangiectasia.
  - 16. Hemangioma.
  - 17. Verruca vulgaris.
- O. Facial pain and neuromuscular diseases.
  - 1. Bell's palsy.
  - 2. Trigeminal neuralgia.
  - 3. Glossopharyngeal neuralgia.
  - 4. Migraine.
  - 5. Temporal arteritis.



6. Burning mouth syndrome.
7. Osteoarthritis.
8. Rheumatoid arthritis.
9. Temporomandibular joint dysfunction.

### VIII. Behavioral Objectives for General Pathology

Objectives should be written for each lecture and should include, but not be limited to definitions of terminology, diagnostic processes and relevance of general pathology to clinical situations. Examples of behavioral objectives appropriate to general pathology include:

1. Define the terms "cell injury" and "cell death."
2. Describe the causes and mechanisms of cell injury and cell death.
3. List and describe the five cardinal signs of inflammation and the physiologic basis for each sign.
4. Define and distinguish between the terms "tissue regeneration" and "tissue repair."
5. Define and contrast the terms "hyperplasia" and "hypertrophy."
6. Define and contrast the terms "metaplasia" and "dysplasia."
7. Define the term "neoplasia."
8. Define the terms "benign" and "malignant," and compare the clinical and histologic differences between benign and malignant neoplasms.
9. Define the term "carcinogenesis" and give examples of carcinogenic agents.
10. Give examples that illustrate the naming system of benign and malignant tumors. List some examples of tumors that do not consistently follow this system.
11. Define the term karyotype and list three examples of karyotype abnormalities.
12. Define and compare the terms "autosomal dominant" and "autosomal recessive."
13. Describe and contrast the primary function of the immune response to the primary function of the inflammatory response.
14. Describe the cellular events that occur in the inflammatory process from initial injury to regeneration or repair.
15. Name the two major divisions of the immune system and name the type of lymphocyte associated with each.
16. Describe the role of the macrophage in the immune response.
17. Describe and compare humoral and cell-mediated immunity and give an example of each.
18. Identify the types of hypersensitivity reactions and provide an example of each.

19. Define the term “opportunistic infection” and list an example of a systemic opportunistic infection and an example of an oral opportunistic infection.
20. Identify examples of bacterial, fungal, protozoal, viral and emerging and re-emerging infections.
21. Differentiate characteristics of bacterial, fungal, protozoal and viral infections.
22. Describe and contrast healing by primary intention, secondary intention and tertiary intention.
23. Identify local and systemic factors that can impair healing.

## **IX. Behavioral Objectives for Oral Pathology**

Objectives should be written for each lecture and should include, but not be limited to, definitions of terminology, diagnostic processes and relevance of oral conditions to clinical situations. Individual dental hygiene programs are encouraged to formulate their own learning objectives. Examples of objectives are provided below.

1. Using clinical photographs, identify oral lesions on the basis of their clinical appearance.
2. Describe and compare clinical, radiographic and histologic features of amelogenesis imperfecta, dentinogenesis imperfecta and dens in dente.
3. Describe the radiographic appearance, location and histologic appearance of odontogenic and nonodontogenic developmental cysts.
4. For each of the following odontogenic tumors, describe the radiologic features, treatment and prognosis: ameloblastoma, ameloblastic fibroma and odontoma.
5. Describe the clinical manifestations of each type of oral candidiasis.
6. Describe the clinical manifestations of primary herpetic gingivostomatitis.
7. Compare and contrast recurrent intraoral herpes simplex infection to recurrent aphthous stomatitis.
8. Define and differentiate between the following: periapical abscess, periapical granuloma, and radicular cyst. Include the radiographic and histologic characteristics of each.
9. Describe and compare the following dental abnormalities: attrition, abrasion and erosion.
10. For each of the following white surface lesions, describe the clinical, histologic appearance and treatment: leukoedema, white sponge nevus, focal hyperkeratosis and nicotine stomatitis.
11. Define the term “cellulitis.”
12. Describe the clinical features of actinomycosis.

13. Describe and compare the clinical characteristics, including the oral features, treatment and prognosis, of pemphigus vulgaris, cicatricial pemphigoid, erosive lichen planus and erythema multiforme.
14. Describe the oral manifestations of Sjögren Syndrome, including the clinical characteristics, differential diagnosis, treatment and prognosis.
15. Identify the etiologies and risk factors of squamous cell carcinoma.
16. Describe the complications associated with treatment of squamous cell carcinoma.
17. Describe the oral manifestations associated with HIV infection.
18. Describe the oral problems that would be expected to occur in a patient with radiation-induced xerostomia.
19. Compare and contrast the characteristic oral manifestations, treatment and prognosis of each type of hematologic disorder: anemia, agranulocytosis, thrombocytopenia and leukemia.
20. Describe the symptoms of various types of facial pain, including Bell's palsy, trigeminal neuralgia and temporomandibular disorder.
21. Describe the etiology, clinical characteristics and treatment of emerging and re-emerging infectious diseases.
22. Determine a differential diagnosis for clinical and radiographic presentations of oral pathoses.
23. Compare the effectiveness of adjunctive devices used to screen for oral cancer.
24. Use the dental hygiene process of care when identifying and managing oral pathoses.

#### **X. Sequencing**

The course in pathology should be taught following basic dental science prerequisites at a point prior to or concurrent with the student's introduction to active clinical experience. Ideally, it should be taught in the second semester of the first year or in the third trimester of the first year of the curriculum.

#### **XI. Faculty**

It is important for the faculty to understand the role of the dental hygienist in the detection of oral diseases and to have a background in those diseases to correlate course content with clinical experience. The faculty should have advanced education in general and oral pathology and a formal background in educational methodology and evaluation.

## **XII. Facilities**

Comfortable lecture theaters/rooms and a comprehensive audio-visual collection of clinical/histological slides or CD-ROM should be available to enhance student instruction and understanding of material.

## **XIII. Occupational Hazards**

There are no occupational hazards associated with this course of instruction.

## **XIV. Bibliography**

### **Textbooks:**

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9. Rubin E, Reisner HM. Essentials of Rubin's pathology. 6<sup>th</sup> ed. Philadelphia: Lippincott Williams & Wilkins, 2014.

### **Journal:**

1. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology*. Published monthly by Elsevier, Inc., New York, New York. At: [www.oooojournal.net](http://www.oooojournal.net).

Online resources (URLs often change therefore links should be checked and updated as necessary):

1. Maxillofacial Center for Education & Research. Oral and Maxillofacial Lesions. At: <http://www.oralpath.com>.
2. Virginia Commonwealth University. Oral Pathology Review Images, Most Common Soft Tissue Abnormalities of the Oral Cavity. At: <http://dig.library.vcu.edu/cdm/search/collection/opr/searchterm/soft%20/order/title>.

## **Periodontology**

### **I. Introduction**

Periodontics: The specialty of dentistry that encompasses the prevention, diagnosis and treatment of diseases affecting the gums and supporting structures of the teeth and in the placement and maintenance of dental implants.

### **II. Interrelationship**

Periodontology integrates the basic, dental and behavioral sciences and is fundamental to the clinical practice of dental hygiene. Because of this overlap with other disciplines, the guidelines do not suggest that all objectives be taught specifically in periodontology courses. Rather, they acknowledge that the minimal objectives should exist in appropriate disciplines within the dental hygiene curriculum.

### **III. Overview**

The periodontology curriculum should provide sufficient instruction to enable the dental hygiene student to recognize and differentiate periodontal health from active and inactive disease, identify and assess periodontal risk factors, formulate a dental hygiene treatment plan, provide initial, non-surgical periodontal and maintenance therapy and recommend referral of patients with periodontal pathology, as appropriate.

### **IV. Primary Educational Goals**

The primary didactic educational goal of the curriculum is acquisition of knowledge of the biological basis for periodontal therapy. The primary clinical educational goals are acquisition of disease-recognition skills, the ability to analyze and assess periodontal risk factors and the development of clinical skills necessary to perform initial, non-surgical periodontal and maintenance therapy within the concept of a comprehensive dental treatment plan. Concentrated efforts should be made to prepare dental hygienists to provide the full scope of care permitted by state practice acts as well as provide evidence-based periodontal therapies.

### **V. Prerequisites**

Prior to beginning the curriculum in periodontology (some courses/content areas may run concurrently with periodontology), the student should have foundation knowledge in oral anatomy, oral histology and embryology, dental morphology and occlusion, microbiology and

immunology, radiology, pathology, pharmacology, communications and behavior modification.

## **VI. Core Content: Didactic**

The didactic portion of the dental hygiene student's educational experience should include information in the following areas:

- A. Periodontal health.
  - 1. Development, anatomy, histology and physiology of the periodontium.
  - 2. Characteristics of a healthy periodontium.
  - 3. Maintenance of periodontal health.
- B. Periodontal risk assessment.
  - 1. Modifiable risk factors.
  - 2. Nonmodifiable risk factors.
  - 3. Clinical application of risk assessment.
  - 4. Interrelationships between periodontitis and systemic disease.
- C. Periodontal diseases.
  - 1. History of the disease.
  - 2. Classification and epidemiology.
  - 3. Clinical features and histopathology .
  - 4. Etiology and pathogenesis.
  - 5. Terminology .
- D. Periodontal therapy.
  - 1. Medical, dental and pharmacologic history.
  - 2. Examination to include intraoral and extraoral examination and periodontal charting, assessment of presence and distribution of biofilm and calculus and radiographic interpretation.
  - 3. Patient assessment, periodontal diagnosis and prognosis.
  - 4. Care planning to include treatment objectives.
  - 5. Therapy.
    - a. General principles.
    - b. Non-surgical.
    - c. Surgical.
    - d. Patient self-care education.
    - e. Pharmacotherapeutic agents.
    - f. Periodontal maintenance.
    - g. Management of oral implantology.
  - 6. Medical and dental referral criteria.

## VII. Didactic Behavioral Objectives

### A. Periodontal health.

1. Describe sequentially the embryologic and histologic development of the periodontium.
2. List and recognize the clinical, histologic and radiographic features of periodontal health and the varying classifications of gingivitis and periodontitis.
3. Describe the functions of the periodontium, including the gingiva, (attached and unattached) cementum, crevicular fluid, junctional epithelium, periodontal ligament and alveolar bone.

### B. Periodontal diseases.

1. List, describe and differentiate various periodontal diseases in a classification system as established by the American Academy of Periodontology. The following clinical entities should be covered in a core periodontal curriculum:

#### I. Gingival diseases.

##### A. Dental plaque induced gingival diseases.

1. Gingivitis associated with dental plaque only.
  - a. Without other contributing factors.
  - b. With local contributing factors (see VIIIA).
2. Gingival diseases modified by systemic factors.
  - a. Associated with the endocrine system.
    - i. Puberty associated gingivitis.
    - ii. Menstrual cycle-associated gingivitis.
    - iii. Pregnancy-associated:
      - (a) Gingivitis.
      - (b) Pyogenic granuloma.
    - iv. Diabetes mellitus-associated gingivitis.
  - b. Associated with blood dyscrasias.
    - i. Leukemia-associated gingivitis.
    - ii. Other.
3. Gingival disease modified by medication.
  - a. Drug-influenced gingival diseases.
    - i. Drug-influenced gingival enlargements.
    - ii. Drug-influenced gingivitis.
      - (a) Oral contraceptive-associated gingivitis.
      - (b) Other.
  4. Gingival disease modified by malnutrition.
    - a. Ascorbic acid-deficiency gingivitis.
    - b. Other.



- B. Nonplaque-induced gingival lesions.
  - 1. Gingival diseases of specific bacterial origin.
    - a. Neisseria gonorrhea-associated lesions.
    - b. Treponema pallidum-associated lesions.
    - c. Streptococcal species-associated lesions.
  - 2. Gingival diseased of viral origin.
    - a. Herpes virus infections.
      - i. Primary herpetic gingivostomatitis.
      - ii. Recurrent oral herpes.
      - iii. Varicella-zoster infections.
    - b. Other.
  - 3. Gingival diseases of fungal origin.
    - a. Candida species infections.
      - i. Generalized gingival candidiasis.
    - b. Linear gingival erythema.
    - c. Histoplasmosis.
    - d. Other.
  - 4. Gingival lesions of genetic origin.
    - a. Hereditary gingival fibromatosis.
    - b. Other.
  - 5. Gingival manifestations of systemic conditions.
    - a. Mucocutaneous disorders.
      - i. Lichen planus.
      - ii. Pemphigoid.
      - iii. Pemphigus vulgaris.
      - iv. Erythema multiforme.
      - v. Lupus erythematosus.
      - vi. Drug-induced.
      - vii. Other.
    - b. Allergic reactions.
      - i. Dental restorative materials.
        - (a) Mercury.
        - b) Nickel.
        - (c) Acrylic.
        - (d) Other.
      - ii. Reactions attributable to:
        - (a) Toothpastes/dentifrices.
        - (b) Mouth rinses/mouthwashes.
        - (c) Chewing gum additives.
      - iii. Other.
  - 6. Traumatic lesions (factitious, iatrogenic, accidental).
    - a. Chemical injury.
    - b. Physical injury.
    - c. Thermal injury.
  - 7. Foreign-body reactions.
  - 8. Not otherwise specified.

- II. Chronic periodontitis.
  - A. Localized.
  - B. Generalized.
- III. Aggressive periodontitis.
  - A. Localized.
  - B. Generalized.
- IV. Periodontitis as a manifestation of systemic disease.
  - A. Associated with hematologic disorders.
    - 1. Acquired neutropenia.
    - 2. Leukemia.
    - 3. Other.
  - B. Associated with genetic disorders.
    - 1. Familial and cyclic neutropenia.
    - 2. Down syndrome.
    - 3. Leukocyte adhesion-deficiency syndromes.
    - 4. Papillon-Lefevre syndrome.
    - 5. Chediak-Higashi syndromes.
    - 6. Histiocytosis syndromes.
    - 7. Glycogen storage disease.
    - 8. Infantile genetic agranulocytosis.
    - 9. Cohen syndrome.
    - 10. Ehlers-Danlos syndrome (types IV and VIII).
    - 11. Hypophosphatasia.
    - 12. Other.
  - C. Not otherwise specified (NOS).
- V. Necrotizing periodontal diseases.
  - A. Necrotizing ulcerative gingivitis (NUG).
  - B. Necrotizing ulcerative periodontitis (NUP).
- VI. Abscesses of the periodontium.
  - A. Gingival abscesses.
  - B. Periodontal abscesses.
  - C. Pericoronal abscesses.
- VII. Periodontitis associated with endodontic lesions.
  - A. Combined periodontal-endodontic lesions.
- VIII. Developmental or acquired deformities and conditions.
  - A. Localized tooth-related factors that modify or predispose to plaque-induced gingival diseases/periodontitis.
    - 1. Tooth anatomic factors.
    - 2. Dental restorations/appliances.
    - 3. Root fractures.
    - 4. Cervical root resorption and cemental tears.
  - B. Mucogingival deformities and conditions around teeth.
    - 1. Gingival/soft tissue recession.
      - a. Facial or lingual surfaces.
      - b. Interproximal (papillary).

2. Lack of keratinized gingiva.
  3. Decreased vestibular depth.
  4. Aberrant frenum/muscle position.
  5. Gingival excess.
    - a. Pseudopocket.
    - b. Inconsistent gingival margin.
    - c. Excessive gingival display.
    - d. Gingival enlargement.
  6. Abnormal color.
  - C. Mucogingival deformities and conditions on edentulous ridges.
    1. Vertical and/or horizontal ridge deficiency.
    2. Lack of gingival/keratinized tissue.
    3. Gingival/soft tissue enlargement.
    4. Aberrant frenum/muscle position.
    5. Decreased vestibular depth.
    6. Abnormal color.
  - D. Occlusal trauma.
    1. Primary occlusal trauma.
    2. Secondary occlusal trauma.
- C. Epidemiology.
1. Describe the incidence, prevalence and etiology of periodontal diseases.
- D. Periodontal risk factors.
1. Identify periodontal risk factors that affect onset, progression and severity of periodontal diseases.
  2. Identify periodontal risk factors that are acquired, environmental and genetic.
  3. Classify changing risk factors from unchanging factors and discuss their potential impact on periodontal health to include:
    - a. Changing: smoking, diabetes, periodontal microbiology, oral hygiene, psychosocial stress, medications, hormone alteration, iatrogenic and local factors, host response and systemic diseases.
    - b. Unchanging: age, gender, genotype positive status, genetic disorders, disease history and race.
  4. Evaluate potential periodontal interrelationships to include: stroke, coronary heart disease, respiratory disease, diabetes, preterm low birth weight deliveries and other conditions associated with progression of periodontal disease.

- E. Clinical features and histopathology.
  - 1. Recognize and describe clinical, radiographic, microbiologic and histopathologic features of various periodontal diseases and differentiate among these diseases.
  - 2. Explain the interplay between periodontal pathogens and the host tissues.
- F. Etiology and immunopathology.
  - 1. Describe the stages of development bacterial colonization and composition of human supragingival and subgingival biofilm.
  - 2. Describe the multifactorial etiology of periodontitis.
  - 3. Identify the role of the host in periodontal disease incidence, severity and breakdown.
  - 4. Describe the components of plaque biofilm that initiate and/or contribute to periodontal disease.
  - 5. Explain microbiologic and immunologic interactions of the host in periodontal diseases.
  - 6. Describe, discuss and illustrate current knowledge of the immunopathology of periodontal disease.
  - 7. Describe the sequential development of inflammatory periodontal disease.
  - 8. Identify bacterial etiologic factors associated with health, gingivitis and periodontitis.
- G. Periodontal therapy.
  - 1. History and examination.
    - a. Recognize and record medical, dental, social and pharmacologic information as well as risk factors that will affect patient management.
    - b. Describe the elements of a complete extraoral and intraoral hard and soft tissue evaluation.
    - c. Define and describe various evaluative methods (probing, clinical attachment levels, bleeding and exudate, mobility, etc.) needed to measure variations from periodontal health.
    - d. Demonstrate an understanding of the use of symbols by transmitting clinical findings to a periodontal chart.
    - e. Describe methods for recognizing microbial plaque biofilm and recording plaque, gingival and bleeding incidences.
    - f. Recognize the rationale, objectives and therapies involved in the various levels of dental hygiene care (preventive oral prophylaxis, therapeutic root debridement and professional periodontal maintenance).
    - g. Describe and define irregularities (calculus, overhangs, etc.) that may be found in a pocket using radiographs, a probe and an explorer.

- h. Recognize and record dental-implant structures.
    - i. Recognize clinical parameters of a stable and/or deteriorating periodontal status when addressing non-surgical periodontal therapy.
- 2. Patient assessment.
  - a. Use history and examination information to correctly describe a patient's periodontal condition, including the extent and severity of any of the periodontal diseases prior to and after treatment.
  - b. Determine the patient's use and understanding of preventive (oral self-care) measures and oral health goals.
  - c. Recognize the need for medical and/or dental referral when appropriate.
- 3. Prognosis.
  - a. Enumerate those factors that are significant in the longevity of the dentition or the progression of disease and the anticipated response to treatment.
  - b. Use the above factors to develop an individual tooth and total-dentition prognosis in a simulated situation.
  - c. Describe modalities of treatment that may be required by patient economics or other factors relative to prognosis.
  - d. Assess patient risk factors significant in determining a prognosis.
- 4. Care planning.
  - a. Develop individual, evidence-based, comprehensive, sequenced dental hygiene care plans for patients using diagnostic information that incorporates the patient's history, goals, values and motivations, clinical assessment, diagnosis, economics and other dental needs.
  - b. Develop dental hygiene treatment plans that include both a preventive education and a clinical treatment component.
  - c. Describe treatment guidelines for a variety of periodontal patients.
  - d. Describe the factors dictating the need for consultation and referral.
  - e. Describe how specific systemic conditions (rheumatic heart disease, diabetes, hypertension, immune system status, age, etc.) and drug usage can influence periodontal treatment planning.
  - f. Discuss precautions necessary for patients with special needs during therapy.
  - g. Define informed consent and describe its importance to treatment planning.
  - h. Describe and develop treatment guidelines for managing periodontal patients with varying degrees of oral and/or systemic involvement.

5. Therapy.

a. General principles.

- 1) Describe and implement techniques to minimize disease transmission during periodontal therapy.
- 2) Use evidence-based protocols to identify periodontal therapies that will reduce the bacterial load and those that modulate the host response.
- 3) Describe pharmacotherapeutics used in periodontal therapy, including pain and anxiety control, local delivery medicaments, systemic medications, postoperative medication and their indications and contraindications.
- 4) Describe the principles of hand and powered instrumentation.
- 5) Describe the management of medical and surgical complications.
- 6) Describe wound healing following various periodontal procedures.
- 7) Describe the role of occlusal trauma in periodontal disease.
- 8) Describe the techniques for management of acute periodontal conditions/emergencies.
- 9) Use case studies to effectively analyze and evaluate ethical dilemmas/situations related to periodontal care.

b. Non-surgical.

- 1) List the goals for self-care for the periodontal patient.
- 2) Compare and contrast the various mechanical and chemical means of plaque biofilm removal/control.
- 3) Explain the role of motivation in the patient's compliance with treatment and self-care recommendations.
- 4) Define nonsurgical periodontal therapy.
- 5) List the components of nonsurgical periodontal therapy.
- 6) Describe the objectives of nonsurgical periodontal therapy.
- 7) Discuss and describe the use and limitations of hand instruments and powered instruments.
- 8) Describe the assessment of a patient's occlusal relationships.
- 9) Describe the role and elimination of iatrogenic factors (open contacts, overhangs, etc.) in periodontal disease.
- 10) Describe the methods of maintaining dental implants.

c. Surgical.

- 1) Explain the objectives and rationale for periodontal surgical treatment.
- 2) Recognize the clinical conditions that are most likely to benefit from surgery.
- 3) List the objectives for various periodontal surgeries.
- 4) Describe the indications, contraindications and methodology for the most-commonly performed periodontal surgical procedures.

- 5) Describe various techniques, materials and rationale for suturing in periodontal therapy.
- 6) Indicate the rationale for placement of periodontal dressings, types available, advantages and disadvantages.
- 7) Discuss postoperative instructions to be given for various periodontal surgical procedures.
- 8) Discuss postoperative emergency situations and the procedures for management.
- 9) Describe the postoperative evaluation of the surgical site.
6. Oral implantology.
  - a. Describe the types of dental implants used in dentistry.
  - b. Describe the types of materials used in implants.
  - c. Describe the procedure for the placement and restoration of implants.
  - d. List the criteria used to judge the success of implants.
  - e. Describe the post-surgical instructions for a patient.
  - f. Describe the techniques, instruments and procedures for implant maintenance.
  - g. Describe the characteristics and pathogenesis of peri-implant diseases.
  - h. Select appropriate self-care aids for patients with dental implants.
7. Re-evaluation appointment.
  - a. Explain the role of the re-evaluation appointment in determining the next phase of periodontal treatment.
  - b. Describe the ideal time frame for a re-evaluation appointment.
  - c. Describe the components of the re-evaluation appointment that assist the clinician in assessing treatment outcome and patient compliance.
  - d. Evaluate the outcomes of periodontal therapies provided to patients.
  - e. Determine if a referral for additional therapy is indicated.
8. Evaluation and periodontal maintenance therapy.
  - a. Discuss the objectives of periodontal maintenance.
  - b. Describe the components of periodontal maintenance.
  - c. Explain the effectiveness of periodontal maintenance in preventing disease development, maintaining health and preventing progression.
  - d. Describe the criteria and methods used in assessing the outcome of maintenance therapy.
  - e. Provide and assess success of periodontal maintenance for patients.
  - f. Describe criteria for modifying a periodontal supportive program.
  - g. Explain the theories and management of dentin hypersensitivity.
  - h. Describe the components of and the role of the dental hygienist in a smoking cessation program.
  - i. Explain the relationship of nutrition to periodontal health.

9. Communication.

- a. Describe and demonstrate effective interpersonal relationships and effective oral and written communications skills with patients, colleagues, other professionals and lay people.

**VIII. Core Content: Clinical**

Upon completion of the dental hygiene curriculum, the dental hygienist should be prepared to provide nonsurgical periodontal therapy, including: data gathering, examination, dental hygiene diagnosis, treatment planning, presurgical evaluation and supportive phases of periodontal therapy. Specifically, the hygienist should be able to gather appropriate patient assessment data, analyze periodontal risk factors, develop preventive treatment plans, provide appropriate self-care education, perform scaling and root debridement, assist with periodontal surgeries, do follow-up assessment and provide periodontal maintenance.

The didactic portion of the periodontology curriculum should be integrated with the clinical dental hygiene program and the acquisition of clinical skills. Students should meet the following clinical goals by the end of the program.

1. Communicate effectively with patients and other dental or health care professionals.
2. Explain principles and implement informed consent prior to beginning therapy.
3. Provide education and clinical services necessary for the prevention/treatment of periodontal diseases.
4. Conduct a periodontal examination.
5. Use recorded information to describe to the patient existing conditions, etiology of the disease process, disease risk factors, treatment required as prescribed and the patient's role in therapy.
6. Provide nonsurgical treatment for gingivitis and periodontitis with complete understanding of the rationale, risk factors, indications, contraindications, and limitations of such therapy.
7. When possible, assist in or observe periodontal surgery; perform presurgical scaling and root planing on patients requiring periodontal surgery.
8. Evaluate the periodontal status of the patient during and after all phases of active treatment and be able to suggest modifications of the dental hygiene treatment plan to accommodate any unanticipated changes in periodontal status and record it.
9. Establish an individualized supportive regimen to include the management of implants.



10. Document all treatment rendered to or refused by the patient according to legal requirements.
11. Manage patients in a safe, ethical and professional manner.

## **IX. Clinical Behavioral Objectives**

- A. The student should be able to communicate effectively with patients, colleagues and other professionals to:
  1. Provide information on the etiology, progressive nature and treatment of periodontal diseases.
  2. Explain the patient's role in therapy.
  3. Facilitate integrated dental care delivery.
  4. Select and appropriately use a variety of powered and hand instruments tailored to meet the periodontal conditions/limitations of each patient's oral environment and root topography.
- B. The student should be able to provide services necessary for preventing periodontal disease, including:
  1. Determining and interpreting plaque biofilm, gingival and bleeding index scores.
  2. Establishing a preventive treatment plan.
  3. Educating to obtain patient compliance.
  4. Providing appropriate microbial biofilm self-care instruction.
  5. Performing scaling, root debridement and selective polishing as indicated.
  6. Providing dietary counseling as indicated.
  7. Providing a smoking cessation program as indicated.
  8. Recognizing contributing etiologic risk factors and treatment needs.
  9. Recommending and teaching use of antimicrobial agents and medications as indicated.
  10. Recommending methods to manage implant health.
- C. Assuming that the acquisition of complete data is covered in other aspects of the curriculum, the student should be able to conduct a periodontal examination that includes:
  1. Conducting the dental and medical history, including identifying chief complaint(s) and history of the present problem as well as performing systemic health review and general intraoral and extraoral examinations.
  2. Performing and interpreting a screening examination for periodontal disease.
  3. Performing a comprehensive periodontal examination by identifying and recording:
    - a. Position of the gingival margin, mucogingival junction and frena.
    - b. Color, contour and consistency of the gingiva.

- c. Mucogingival abnormalities/deformities.
  - d. Sulcus or pocket depths.
  - e. Attachment level.
  - f. Bleeding upon probing.
  - g. Suppuration.
  - h. Plaque biofilm and calculus accumulations.
  - i. Tooth position and root proximity.
  - j. Furcation involvements.
  - k. General anatomic features of significance in periodontal therapy.
  - l. Tooth mobility and fremitus.
  - m. Wear facets.
  - n. Premature occlusal contacts.
  - o. Restorations for potential pathos.
  - p. Radiographic evidence of root proximity, root form, furcation involvements, crown–root ratio, overhanging restorations, impactions, trabeculations, bone density and bony defects of pathology.
  - q. Condition of tissue surrounding implants.
  - r. Disease risk factors.
- D. The student should be able to use recorded assessment data to determine patient needs and to develop a dental hygiene diagnosis and treatment plan within the patient's comprehensive treatment plan, including:
- 1. Identifying disease process present.
  - 2. Identifying etiologic and disease risk factors.
  - 3. Determining prognosis.
  - 4. Formulating the dental hygiene treatment plan and integrating it with other needed oral care, with consideration of systemic and psychosocial factors.
  - 5. Determining the need for consultations and/or referrals.
- E. The student should be able to provide nonsurgical treatment for gingivitis and periodontitis with complete understanding of the rationale, indications and contraindications and limitations for therapy, including:
- 1. Self-care education and oral hygiene instruction with reinforcement.
  - 2. Removal of overhangs and amalgam polishing.
  - 3. Scaling and definitive root debridement.
  - 4. Desensitization.
  - 5. Dietary counseling.
  - 6. Smoking cessation.
  - 7. Pharmacotherapeutics (antimicrobial, fluorides, use of anesthetics, etc.).

- F. The student should be able to evaluate the periodontal status of the patient before, during and after all phases of active treatment and modify the dental hygiene treatment plan to accommodate any unanticipated changes in the periodontal status.
- G. Given a patient who has undergone periodontal therapy, the student should be able to establish a maintenance regimen by:
  - 1. Assessing, planning and implementing additional procedures that may be necessary to prevent further periodontal disease progression.
  - 2. Recognizing and, in collaboration with the dentist, referring patients whose recurrent periodontal disease requires advanced therapy.
  - 3. Evaluating and providing periodontal care for patients with dental implants.
- H. Students and faculty should be encouraged to obtain the Hepatitis-B vaccine prior to providing clinical treatment of patients.

## **X. Sequencing**

The periodontology curriculum should be scheduled in the program after the relevant basic and dental science topics have been presented. The sequencing will provide students with the prerequisite knowledge for entry into the periodontal component of the curriculum. The basic periodontology curriculum should be scheduled in the first year in typical two-year programs, with integration of the material throughout the second year, in order to provide adequate opportunity for developing required skills and knowledge to attain competency in treating periodontal patients.

## **XI. Faculty**

The faculty for both didactic and clinical education should have an appropriate background in periodontology. The course faculty might include individuals with a variety of backgrounds and advanced periodontology education/training. The dental hygiene educator should be involved in advancing the curriculum through activities such as continuing education, research, cotherapy and faculty practice. Clinical instruction in nonsurgical initial therapy procedures should include dental hygienists who have had periodontal practice experience. All faculty involved in the periodontal component of the curriculum should have backgrounds in education methods, testing and measurement, and evaluation.

## XII. Facilities

Facilities and equipment should provide students with the opportunity to achieve the objectives of both the clinical and didactic portions of the periodontology curriculum.

## XIII. Occupational Hazards

Due to the exposure of students and faculty to diseases that are transmitted by blood, saliva and airborne microorganisms, federal and professional regulatory agency guidelines—such as those from CDC, OSHA and EPA—should be followed. Students and faculty are encouraged to obtain the Hepatitis-B vaccine prior to providing clinical treatment of patients.

## XIV. Educational Strategies

There are several educational methodologies that are appropriate for the periodontal curriculum. Problem, intervention, comparison and observation (PICO) questions are an excellent way to introduce evidenced-based treatment/research into the course. Additional educational methodologies include: writing abstracts from peer reviewed journals; case study development and presentations; group discussions of slides of gingival conditions; and using the CONSORT Checklist to apprise literature reviews. Case study development is an ideal way to incorporate the oral systemic link. Critical thinking skills are used when students are required to case type periodontal disease based on assessments. The American Academy of Periodontology provides an excellent video of various periodontal procedures.

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## **XVI. Electronic Resources**

1. American Academy of Periodontology: Source for professional and client education with position papers and parameters of care information. At: [www.perio.org](http://www.perio.org).
2. American Dental Association: Professional resources including CE courses, scientific publications and ADA library. At: <http://ada.org/professional.aspx>.

Arestin® Student Access: Provides students with clinical information about periodontal disease, patient selection and treatment of perio that includes Arestin and SRP.

3. Asking a Good Question: Defines and gives examples for utilizing PICO questions. At: <http://www.usc.edu/hsc/ebnet/ebframe/PICO.htm>.
4. Crest Dental Resource Center: Scientific America presents this Oral and Whole Body Health publication, which discusses current information on risk factors and systemic disease. At: <http://www.dentalcare.com/media/en-US/products/owbh.pdf>.
5. International Academy of Periodontics: Abstracts related to periodontal research and general information on periodontics. At: <http://www.perioiap.org>.
6. PreViser, Inc.: Provides information related to the computerized risk assessment tool for oral diseases. At: <http://www.previser.com>.
7. UCLA Periodontics Information Center: Periodontal cases for review and periodontal-related free courses. At: <http://www.dent.ucla.edu>.
8. Using the CONSORT for Abstracts checklist: Series of slides providing illustrative examples of randomized trials using the CONSORT for Abstracts checklists. At: <http://www.consort-statement.org>.
9. 3M ESPE Expertise Education: Online Dental CE courses and scientific resources. At: [http://solutions.3m.com/wps/portal/3M/en\\_US/3M-ESPE-NA/dental-professionals/education/expertise-education/](http://solutions.3m.com/wps/portal/3M/en_US/3M-ESPE-NA/dental-professionals/education/expertise-education/).

## **Pharmacology**

### **I. Introduction**

Pharmacology is defined as the science of drugs. As a biomedical science, pharmacology embraces the physical and chemical properties of drugs, the preparation of pharmaceutical agents, the pharmacokinetics of drugs and the effects of drugs on living systems. As a clinical discipline, pharmacology encompasses the therapeutic application of medicines, toxicity and practical and legal issues pertaining to the development, marketing and dispensing of drugs. Pharmacology is clearly a complex and dynamic subject with new drugs entering the market place very frequently.

### **II. Interrelationship**

With both biomedical and clinical science dimensions, pharmacology interrelates with a broad array of disciplines. Those biomedical sciences most closely associated with pharmacology include biochemistry, physiology and pathology.

### **III. Primary Education Goals**

Three primary goals must be attained in a course of instruction in pharmacology: (1) the student must analyze the principles of pharmacology, sufficient to permit the proper medical evaluation of patients for dental hygiene care; (2) the student must identify the influences drugs taken for nondental purposes may have on a proposed treatment and modify the treatment plan accordingly; and (3) the student must recognize therapeutic agents used in the routine practice of clinical dentistry and provide the patient with appropriate instructions for compliance.

### **IV. Prerequisites**

Pharmacology instruction should be offered subsequently to courses in anatomy, physiology and biochemistry and at least concurrently or prior to courses in microbiology and pathology.

### **V. Core Content Outline**

For each of the classes of drugs listed below, the following information will be described:

1. Definitions.
2. Review of biomedical sciences relevant to organ systems/disease state(s) affected by these drugs.
3. Pharmacologic category.
4. Mechanism of action and therapeutic effects.

5. Structure–activity relationships, if clinically relevant.
6. Pharmacokinetics, if clinically relevant.
7. Adverse effects.
8. Drug interactions.
9. Contraindications.
10. Implications for dentistry.

A. Principles of pharmacology.

Understanding the basic principles of pharmacology is essential in at least two respects. These foundational principles provide the student with 1) a framework in which all drugs may be studied and applied to clinically relevant situations, and 2) the necessary tools to critically evaluate new therapeutic agents.

1. Sources of drug information.
2. Terminology.
3. Routes of drug administration.
4. Pharmacokinetics.
5. Dose–response relationships.
6. Drug-receptor reactions: mechanisms of drug action.
7. Patient variables affecting drug response: age, gender and medical conditions.
8. Adverse drug reactions and their prevention.
9. Drug interactions: mechanisms and classification.
10. Dosage forms.
11. Toxicologic evaluation of medications (Therapeutic Index, LD50, Ed 50).
12. Drug names (trade, generic and chemical).
13. Schedules of controlled substances (I, II, III, IV, V).
14. Food and Drug Administration pregnancy categories (A, B, C, D, X).
15. Phases of drug testing.

B. Prescription writing and drug regulation.

Prescription writing reflects knowledge of pharmacology in concert with diagnostic ability. The dentist has the responsibility to make the correct choice of drug, proper dosage and number of doses. The dentist and dental hygienist share the responsibility for providing complete instructions for patient use. For these reasons, the technique of prescription writing should be an integral part of the pharmacology curriculum for both dental and dental hygiene students. It is appropriate to include in this section the traditional format of a prescription; however, it is strongly recommended to use the metric system and English, rather than the traditional system. Laws relating to drug development, regulation and control are directly related to prescription writing and dental office use. These laws have some specific requirements that influence the practice of dentistry and dental hygiene. For this reason, federal and state drug laws should be included in this section of the pharmacology curriculum. Key topic in this section are:

1. Essentials of prescription writing.
2. Laws and regulations (controlled substances).
3. New drug development.
4. Dispensing of drugs.
5. Common abbreviations.

C. Autonomic nervous system.

The physiological processes and metabolic activities of human organ systems are regulated by chemical transmitters released from neurons of the autonomic nervous system (ANS). Many pharmacological agents directly or indirectly mimic or block the actions of the ANS neurotransmitters. Enhancement or depression of autonomic activity can have profound systemic consequences as well as local effects on the oral cavity (e.g., salivary flow). These fluctuations in autonomic activity may also modify the patient's response to other pharmacologic agents. The concept of receptors has evolved from experimental studies of ANS function, providing a rational basis for selective drug action.

1. Parasympathetic drugs.
  - a. Cholinergic drugs (parasympathomimetic).
    - i. Muscarinic receptor agonists.
    - ii. Nicotinic receptor agonists.
    - iii. Cholinesterase inhibitors.
  - b. Anticholinergic drugs.
    - i. Muscarinic receptor antagonists.
    - ii. Nicotinic receptor antagonists.
2. Sympathetic drugs.
  - a. Adrenergic drugs (sympathomimetics).
    - i. Nonselective adrenergic agonists.
    - ii. Selective adrenergic agonists (e.g.,  $\beta_2$  agonists).
  - b. Adrenergic blocking drugs (sympatholytics).
    - i. Nonselective adrenergic antagonists.
    - ii. Selective adrenergic antagonists (e.g.,  $\alpha_1$  antagonists,  $\beta_1$  antagonists).
    - iii. Centrally acting sympathetic inhibitors (central  $\alpha_2$  agonists).
3. Neuromuscular blocking agents and skeletal muscle relaxants.
  - a. Reversible neuromuscular blockers (curare compounds).
  - b. Depolarizing neuromuscular blockers.
  - c. Skeletal muscle relaxants.
4. Drugs that affect autonomic signaling pathways (e.g., cGMP-phosphodiesterase inhibitors such as sildenafil/Viagra®).



D. Cardiovascular drugs.

Hypertension and cardiac disease are among the most common disorders afflicting the general population. Large numbers of patients take cardiovascular drugs alone or in combination. The dentist and dental hygienist must thoroughly review the medical history for cardiovascular conditions that may warrant prophylactic antibiotic coverage prior to dental treatment or may present a risk for a medical emergency while receiving treatment in the dental office. Identification of appropriate local anesthetic agents and vasoconstrictors based on cardiovascular conditions and medications must be considered.

1. Diuretics.
  - a. Thiazide diuretics.
  - b. Loop diuretics.
  - c. Potassium-sparing diuretics.
  - d. Osmotic diuretics.
  - e. Carbonic anhydrase inhibitors.
2. Antihypertensive drugs.
  - a. Diuretics.
    - i. Thiazide diuretics.
    - ii. Loop diuretics.
  - b. Adrenergic blocking drugs.
    - i.  $\beta$ -blockers (include cardioselective vs. nonselective  $\beta$ -antagonists).
    - ii.  $\alpha_1$ -blockers.
  - c. Calcium channel blockers.
    - i. Nonselective calcium channel blockers.
    - ii. Selective calcium channel blockers (dihydropyridines).
  - d. ACE inhibitors.
    - i. Angiotensin II receptor antagonists.
    - ii. Direct acting vasodilators.
    - iii. Lifestyle modifications for control of hypertension.
3. Drugs for heart failure.
  - a. ACE inhibitors.
  - b.  $\beta$ -blockers.
  - c. Diuretics.
  - d. Cardiac glycosides.
  - e. Phosphodiesterase inhibitors.
4. Antianginal drugs.
  - a. Organic nitrates.
  - b.  $\beta$ -blockers.
  - c. Calcium channel blockers.
5. Antiarrhythmic drugs.
  - a. Class I antiarrhythmics.
  - b. Class II antiarrhythmics.
  - c. Class III antiarrhythmics.
  - d. Class IV antiarrhythmics.

6. Drugs for disorders of blood coagulation.
  - a. Oral anticoagulants.
  - b. Parenteral anticoagulants.
  - c. Antiplatelet drugs.
  - d. Fibrinolytic drugs.
  - e. Antifibrinolytic drugs.
7. Drugs for hyperlipidemias.
  - a. HMG-CoA reductase inhibitors (statins).
  - b. Bile acid-binding resins.
  - c. Cholesterol uptake inhibitors.
  - d. Fibrates.
  - e. Niacin.
8. Drugs for pulmonary arterial hypertension (PAH).
  - a. Phosphodiesterase (PDE) inhibitors (sildenafil [Viagra]).
  - b. Digitalis drugs.
  - c. Prostanoids.

E. Sedative/hypnotic (anti-anxiety) drugs.

These drugs represent one of the more widely used classes of drugs in the dentist's armamentarium for the management of dental fear or anxiety. In addition, patients may be prescribed these agents for sleeping or coping with the stresses of daily living. Due to the likelihood that the dentist will make extensive use of this class of drugs and because of adverse reactions and the potential for drug interactions, the dentist and dental hygienist should understand the pharmacology of this group of drugs.

1. Benzodiazepines.
2. Benzodiazepine receptor agonists.
3. Barbiturates.
4. Nonbarbiturate, nonbenzodiazepin sedative-hypnotics (e.g., hydroxyzine, chloral hydrate).
5. Centrally acting muscle relaxants.

F. Analgesics.

The ability to relieve pain is one of the responsibilities of the dentist. The dentist approaches the problem of dental pain in two ways: through dental treatment and through the rational use of drugs. Instruction in the pharmacology of the various classes of analgesic drugs is central to a dental and dental hygiene pharmacology curriculum.

1. Opioids.
  - a. Opioid agonists.
  - b. Opioid antagonists.
2. Opioid partial agonists (mixed agonist-antagonists).

3. Non-narcotic analgesics and nonsteroidal anti-inflammatory drugs (NSAIDs).
  - a. Nonselective cyclooxygenase (COX) inhibitors.
  - b. COX-2 inhibitors.
  - c. Non-NSAID pain relievers (acetaminophen).
4. Drugs for migraine headaches.
  - a. Ergots.
  - b. Triptans.

G. Local anesthetics.

Recognizing the special relationship between local anesthetics and the practice of dentistry, it is imperative that the student be well-versed in all phases of the pharmacology of these drugs. The depth of coverage must be sufficient to permit the rational selection and safe use of the various preparations available to the dentist and dental hygienist. (Note: for those dental hygiene programs teaching the administration of local anesthesia to clinical competency, a more in depth pain control course with a laboratory component is indicated.)

1. Routes of administration for local anesthetics.
2. Ester-type local anesthetics.
3. Amide-type local anesthetics.
4. Vasoconstrictors and local anesthetics.
5. Non-amide, non-ester type anesthetics.

H. General anesthetics.

While it is not likely that general anesthesia will be used in the majority of dental practices, lectures on this subject should be included in a basic pharmacology course. The study of general anesthetics is essential for any dental professional who uses these agents (e.g., nitrous oxide) in any setting.

1. General anesthesia background (e.g., depth of sedation, stages of anesthesia).
2. Inhaled anesthetics.
  - a. Gases (nitrous oxide).
  - b. Volatile agents (liquids).
3. Intravenous anesthetics.
  - a. Benzodiazepines.
  - b. Barbiturates.
  - c. Opioids.
4. Adjuncts to anesthesia (e.g., sedative-hypnotics, neuromuscular blockers, antiemetics).

A. Antiseizure drugs.

Approximately 1% of the population experiences an unprovoked seizure at least once during their lifetimes. Thus, it is important for the dentist and dental hygienist to identify seizure disorders, the drug therapy associated with them and how to appropriately manage a seizure in the dental setting. In addition, phenytoin, one of the most widely used antiseizure drugs, has prominent oral side effects, which are magnified when combinations of these drugs are used.

1. Phenytoin.
2. Valproates.
3. Succimides.
4. Gabapentin.
5. Benzodiazepines.
6. Other antiseizure drugs (lamotrigine, carbamazepine).

B. Antiparkinson drugs.

Parkinsonism is a neurological disorder that is due to a relative lack of the neurotransmitter, dopamine, in the basal ganglia of the brain. The continued improvement of therapy for the management of this neurological disease, with the consequent improvement in longevity of this group of patients, makes it likely that the dentist and dental hygienist will provide therapy to an increased number of these patients. Knowledge of the various drugs employed, together with the rationale for their use in this disorder, will enable the student to assess patients with this disorder and the problems involved with the dental management of these patients. Furthermore, a discussion of this group of drugs is important because it illustrates how an understanding of the biochemical basis of a disease can lead to the development of more specific and effective drug therapy.

1. Dopaminergic drugs.
  - a. Levodopa and carbidopa.
  - b. Dopamine receptor agonists.
  - c. COMT inhibitors.
  - d. Monoamine oxidase-B (MAO-B) inhibitors.
2. Anticholinergic drugs.

K. Drugs for Alzheimer's disease.

Many elderly, particularly those with dementia or Alzheimer's disease, lack understanding due to a cognitive, sensory or functional impairment or have not been properly educated by their health care providers about the negative outcomes of drug interactions and poor compliance. Many of the drugs taken by the older adult reduce salivary flow thereby increasing their susceptibility to root caries. Patients with advanced dementia may require some form of sedation for dental visits.

1. Central cholinesterase inhibitors.
2. Glutamate receptor antagonists.
3. Nasally administered insulin.

L. Psychotherapeutic drugs.

Pharmacotherapy is a primary form of treatment for most forms of mental illness. Since the dentist and dental hygienist are responsible for treating patients receiving such drugs, a comprehensive knowledge of the pharmacology of this group of drugs is essential. It is worthy to note that many of these drugs produce oral side effects (xerostomia) and some produce facial motor disorders (tardive dyskinesia).

1. Antipsychotic drugs.
  - a. Typical antipsychotics.
  - b. Atypical antipsychotics.
  - c. Dopamine system stabilizers.
2. Antidepressant drugs.
  - a. Tricyclic antidepressants.
  - b. Selective serotonin reuptake inhibitors (SSRIs).
3. Antidepressants with mixed pharmacology (e.g., bupropion, venlafaxine, trazodone).
  - a. MAO inhibitors.
4. Drugs for bipolar disorder (mood stabilizers).
  - a. Lithium.
  - b. Atypical antipsychotics (e.g., olanzapine).
  - c. Antiseizure drugs (e.g., valproates).
5. Drugs for anxiety disorders.
  - a. Azapirones (e.g., buspirone).
  - b. SSRIs.
  - c. Benzodiazepines.
6. Drugs for attention deficit hyperactivity disorder (ADHD).
  - a. Stimulants.
  - b. Nonstimulant drugs for ADHD.

M. Drugs of abuse.

The dental hygienist may at any time treat patients already compromised by drug habits. Drug abusers are not ignorant of the many ways to obtain prescriptions and therefore may contact a dentist personally or by telephone, claiming a dental problem requiring analgesic or sedative-type agents. Of equal importance is that the health professional may be at risk of becoming an abuser. An awareness of the personal and professional consequences of self-abuse of drugs by the dental professional is mandatory. Alcohol and tobacco are the most widely used and abused drugs and have known negative effects on oral health, including oral cancer.

1. Drug abuse terminology.
2. Alcohol.
3. Tobacco.
4. Marijuana.
5. Hallucinogens.
6. Stimulants.
  - a. Cocaine.
  - b. Amphetamines.
7. Depressants.
8. Opioids.
9. Inhalants.
  - a. Nitrous oxide.
  - b. Solvents.

N. Endocrine agents.

Millions of individuals are under endocrine therapy with agents such as oral contraceptives, adrenal cortical steroids, thyroid hormones and insulin. Some of these drugs are known to compromise the dental patient, may require an alteration in dental treatment or may pose a risk for a medical emergency in the dental office.

1. Adrenal corticosteroids.
  - a. Glucocorticoids.
  - b. Mineralocorticoids.
2. Female reproductive hormones (estrogens, progestins and their antagonists).
3. Male reproductive hormones (androgens, androgen antagonists).
4. Oral contraceptives.
5. Hormone replacement therapy.
6. Antidiabetic drugs.
  - a. Insulin.
  - b. Sulfonylureas.
  - c. Biguanides.
  - d. Glitazones.
  - e. Other antidiabetic drugs (alpha-glucosidase inhibitors, thiazolidinediones).
7. Thyroid agents.
  - a. Replacement thyroid hormone.
  - b. Antithyroid agents.
  - c. Radioactive iodine.

O. Drugs affecting immune function.

Host resistance may be affected by numerous factors. Systemically, drugs, diseases (i.e., diabetes, leukemia, AIDS, lupus, etc.) and conditions (i.e., sleep deprivations and anxiety) may reduce immune function and increase

susceptibility to infection. The mechanism of action of some drugs is to impair the immune system to reduce donor rejection while for other drugs immunosuppression is an adverse effect. Patients taking immunosuppressive drugs may exhibit gingival hyperplasia, stomatitis or potentially fatal opportunistic infections from a dentally induced septicemia.

1. Antihistamines and related agents.
  - a. First-generation antihistamines.
  - b. Second-generation antihistamines.
  - c. Cromones (mast cell stabilizers).
2. Glucocorticoids.
3. Immunosuppressive agents.
4. Cytokines and anticytokines.

P. Drugs for arthritis and gout.

The dentist and dental hygienist need to be aware of the significant complications associated with the drugs used to manage these conditions. These include adrenal suppression, impaired healing, increased infection, prolonged bleeding and stomatitis. Patients with advanced joint destruction and subsequent joint replacement may require antibiotic coverage prior to dental procedures.

1. Drugs for osteoarthritis.
  - a. Non-narcotic analgesics/NSAIDs.
  - b. Glucocorticoids.
2. Drugs for rheumatoid arthritis.
  - a. NSAIDs.
  - b. Disease-modifying antirheumatic drugs.
    - i. Antimalarials.
    - ii. Methothrexate.
    - iii. Anticytokines.
    - iv. Glucocorticoids.
3. Drugs for gout and gouty arthritis.
  - a. NSAIDs.
  - b. Other antiinflammatory drugs (colchicine).
  - c. Uricosuric agents and inhibitors of uric acid synthesis.

Q. Antineoplastic drugs.

Many antineoplastic drugs have a devastating effect on the cells of the oral cavity. In addition, they affect many other body sites that have a high mitotic index. The dentist and dental hygienist are obligated to understand their pharmacology, oral manifestations and implications for dental treatment. The student must become familiar with the palliative measures available to relieve oral discomfort associated with drug-induced oral complications of cancer chemotherapy.

1. Alkylating agents.
2. Antimetabolites.
3. Plant alkaloids.
4. Antitumor antibiotics.
5. Hormones.
6. Immune modulators.
7. PARP inhibitors.

R. Antimicrobial drugs.

The dental practitioner commonly prescribes antimicrobial agents for both the treatment and prevention of infection. For this reason, the antibiotics used in dentistry must be discussed in detail. In addition, patients may be receiving antimicrobial agents for a variety of systemic diseases, which may have implications for the dental practitioner. The development of widespread antibiotic resistance is also becoming a significant issue in clinical practice. Knowledge of the practices regarding antibiotic premedication for cardiac conditions and total joint replacement is an essential component of the study of antimicrobial drugs.

1. Antibiotics.
  - a. Penicillins.
  - b. Cephalosporins.
  - c. Tetracyclines.
  - d. Macrolides.
  - e. Clindamycin.
  - f. Metronidazole.
  - g. Aminoglycosides.
  - h. Sulfonamides.
  - i. Quinolones.
  - j. Miscellaneous antibiotics (vancomycin, nitrofurantoin, trimethoprim-sulfamethoxazole).
2. Antiviral drugs.
  - a. Antiherpes virus agents.
  - b. Anti-influenza agents.
  - c. Antiretroviral agents.
    - i. Nucleoside reverse transcriptase inhibitors.
    - ii. Non-nucleoside reverse transcriptase inhibitors.
    - iii. Protease inhibitors.
    - iv. Fusion inhibitors.
3. Antifungal drugs.
  - a. Imidazoles.
  - b. Other antifungals (amphotericin B, nystatin, griseofulvin, terbinafine, clotrimazole, ketoconazole, fluconazole).
4. Antiparasitic drugs.



5. Fluoride.
6. Chlorhexidine.

#### S. Gastrointestinal drugs.

Antacids and other drugs that affect gastrointestinal motility and absorption are among the most widely used drugs. They are frequently prescribed by physicians, but are also widely self-prescribed. In addition to their beneficial effects, the drugs possess great potential for toxicity and drug interactions. It behooves the dentist and dental hygienist to be thoroughly familiar with the pharmacology of these agents.

1. Antiulcer agents.
  - a. H<sub>2</sub> receptor antagonists.
  - b. Proton pump inhibitors.
  - c. Antibiotics for *H. pylori* infection.
2. Antidiarrheal agents.
3. Laxatives and stool softeners.
4. Antiemetics.
5. Emetics.
6. Antacids.

#### T. Respiratory drugs.

Respiratory drugs, including oxygen and various bronchodilators, are widely used. The risk for medical emergencies among patients using these drugs represents an important area of interest to dentistry. Since dental treatment may also have adverse effects on respiration, drugs useful in treating respiratory distress should be covered to provide a basis for their safe and effective administration.

1. Drugs for asthma and chronic obstructive pulmonary disease (COPD).
  - a. Adrenergic agonists.
  - b. Inhaled glucocorticoids.
  - c. Leukotriene modulators.
  - d. Cromones.
  - e. Anticholinergic drugs.
  - f. Methylxanthines.
2. Drugs for respiratory allergies.
  - a. Intranasal glucocorticoids.
  - b. Antihistamines.
  - c. Cromones.
3. Cough suppressants, decongestants, expectorants and mucolytics and antitussives.
4. Drugs for tuberculosis.

U. Ophthalmic drugs.

Drugs used for the treatment of acute eye conditions rarely have oral implications due to their short-term use. The dental operatory light may be a consideration. Drugs used in the management of glaucoma may produce significant systemic reactions, including oral side effects.

1. Drugs for glaucoma.
  - a. Beta blockers.
  - b. Prostaglandin analogs.
  - c. Carbonic anhydrase inhibitors.
2. Mydriatics and cycloplegics.

V. Vitamins and dietary supplements (may be included in nutrition coursework).

Nonprescription dietary supplements in the form of vitamins, minerals and herbs are widely used. Often patients will not mention these supplements when asked about what medications they are currently taking. The dentist and dental hygienist must be informed regarding each supplement's functional role, sources, recommended dosage, signs and symptoms of deficiency and adverse reactions from excessive use. Many of the complications, such as anticoagulation, can affect dental management.

1. Vitamins.
2. Minerals.
3. Herbal supplements.
4. Other supplements.

W. Oral lesions and pharmacologic agents.

1. Infectious lesions (necrotizing ulcerative gingivitis, herpes infections, candidiasis, angular cheilitis, alveolar osteitis).
2. Immune reactions (recurrent aphthous stomatitis, lichen planus).
3. Drug-induced oral lesions (xerostomia, sialorrhea, hypersensitivity-type reactions, gingival enlargement).
4. Autoimmune-type oral lesions (lichenoid-like eruptions, lupus-like eruptions).
5. Bisphosphonates.
  - a. Specific agents.
  - b. Risk factors.
  - c. Antiresorptive osteonecrosis of the jaw (ARONJ).
6. Smoking cessation agents.
  - a. Nicotine replacement therapy (patches, gums, sprays).
  - b. Antidepressants.
  - c. Antiwithdrawal.

## **VI. Behavioral Objectives**

At the completion of the dental and dental hygiene curriculum in pharmacology the student must be able to:

- A. Describe general principles of pharmacology:
  - 1. Identify the acts and the regulatory agencies within the federal government that affect the use of medications.
  - 2. Select and discuss drug information references available to research information.
  - 3. Identify the format of a prescription and the common abbreviations used.
  - 4. Describe basic mechanisms of drug action, including receptor-mediated and receptor-independent actions, agonists and antagonists and dose–effect relationships.
  - 5. Define the basic principles of pharmacokinetics within the body.
  - 6. Identify factors that influence the pharmacokinetics of drugs.
  - 7. Evaluate therapeutic applications of drugs, including routes of administration and variables that affect drug response.
  - 8. Interpret pharmacologic effects, adverse reactions, contraindications and general methods of toxicity prevention.
  - 9. Research the mechanism and classification of drug interactions.
  - 10. Review the toxicological evaluation of drugs.
  - 11. Identify factors that may alter the effect of a medication.
  - 12. Define ways in which medications are named (brand, generic or chemical) and the significance of each.
- B. Research the categories of drugs prescribed for use in dentistry as well as the categories of drugs taken by dental patients.
  - 1. Analyze the pharmacological effects of each category of drugs as well as their mechanism of action.
  - 2. Describe the adverse reactions, contraindications and drug interactions for each category of drugs.
  - 3. Identify dental considerations and modifications to treatment that might be necessary based on the specific drug category.
  - 4. Identify medications by name (generic and brand) that fall within each of the categories of medications.

## **VII. Sequencing**

The course in pharmacology should be taught following basic dental science prerequisites at a point prior to or concurrently with the student's introduction to active clinical experience. Ideally, the course should be taught in the first semester of the second year or in the third trimester of the first year of the curriculum. It is imperative that content related to local anesthesia

agents be provided prior to or concurrently with the laboratory experience of administering local anesthetics.

### **VIII. Faculty**

Faculty teaching pharmacology in a dental hygiene program should have professional training in pharmacology or advanced education courses in pharmacology. It is important for faculty to understand the role of the dental hygienist in medical history assessment and evaluation and the necessity to understand drugs, possible drug interactions and potential emergencies. In addition, faculty should have a formal background in educational methods, testing and measurement, and evaluation.

### **IX. Educational Strategies**

This content is conducive to traditional face-to-face, online or hybrid delivery. In an online course, the didactic content is delivered online using best practices including weekly content modules that may include textbook readings, narrated PowerPoint lectures, websites, videos, podcasts or YouTube videos. Weekly discussion boards and individual or group assignments, such as concept maps, literature reviews, and student-created pharmacology clinical guides, encourage student participation. Assessment may be accomplished through reflective blogs, online quizzes and exams and electronic portfolios. In a hybrid course, the didactic component may be delivered online just as in the fully online course, and a face-to-face component may include a “flipped” classroom of active learning experiences, such as writing prescriptions, dispensing medicaments and adjunctive therapies, developing and/or solving case studies, creating pharmacology learning guides or clinical manuals, role-playing with communication skills and possibly human-patient or high-fidelity manikin simulation. Simulation with a debriefing by a qualified instructor and reflective activities supports self-assessment and critical thinking. When available, students should be exposed to interprofessional education (IPE) experiences to further understanding of the dental hygienist’s role on the collaborative health care team.

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Additional Resources:

**NIH: U.S. National Library of Medicine, DailyMed**

DailyMed is the official provider of FDA label information (package inserts). This website provides a standard, comprehensive, up-to-date, look-up and download resource of medication content and labeling found in medication package inserts. At:

<http://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=c0f238ff-2804-4150-9766-22a5111b4e74>.

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**Med Line Plus**

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**The Internet Journal of Advanced Nursing Practice**

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**The Importance of Pharmacology in the Delivery of Quality Dental Care**

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**Soft Chalk Activities**

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**Pharmacology Videos**

At:

<http://pharmacologytube.blogspot.com/search/label/Autonomic%20Pharmacology?&max-results=9>.

**Antibiotic Interference with Oral Contraceptives**

At:

[http://www.ineedce.com/coursereview.aspx?url=2584%2FPDF%2F1404cei\\_Wahl\\_web.pdf&scid=15307](http://www.ineedce.com/coursereview.aspx?url=2584%2FPDF%2F1404cei_Wahl_web.pdf&scid=15307).

**Anticoagulants and Antiplatelet Drugs in Dentistry: Stop the Interruption**

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**Pradaxa and Xarelto: Coming Soon to Your Practice!**

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**Prosthetic Joints and Antibiotic Prophylaxis**

At:

[http://www.ineedce.com/coursereview.aspx?url=2427%2FPDF%2F1306RDH081-087\\_web.pdf&scid=15061](http://www.ineedce.com/coursereview.aspx?url=2427%2FPDF%2F1306RDH081-087_web.pdf&scid=15061).

**Orange Book: Approved Drug Products with Therapeutic Equivalence Evaluations**

At: <http://www.accessdata.fda.gov/scripts/cder/ob/>.

## **Research for Dental Hygiene Education**

### **I. Introduction**

Health information is emerging at an increasingly rapid rate, concomitantly revising our understanding of the sciences fundamental to dental hygiene practice. These curriculum guidelines in oral health research are designed to assist dental hygiene faculty in preparing future professionals to value the scientific method in the problem-solving process and use it for decision-making during the delivery of dental care. Oral health research refers to research methodology specifically aimed at improving oral health and the delivery of dental care.

### **II. Interrelationships**

Oral health research serves as the scientific knowledge base for the practice, growth and refinement of the dental professions. Research findings derive from methodologically sound investigations, meta-analysis and systematic reviews—the backbone of meaningful problem-solving and decision-making. In addition, well-controlled, scientific research permits the most valid assessment, prevention and treatment of oral disease and is integral to the curriculum and practice. Knowledge and application of the most current research findings enable the delivery of the highest-quality patient-care services. Professional accountability demands dental hygienists to evaluate the methods used to conduct research and consequently to ascertain the meaningfulness of study results to patient care.

A curriculum in oral health research will encourage the student to think critically, ask questions and seek scientifically based solutions to problems through application of evidence-based decision-making.

### **III. Overview**

An understanding of research and its relationship to theory development, to the dental hygiene knowledge base, and, ultimately, to the practice of the professions is fundamental for comprehensive education. In order to effectively assess and produce scientific research, skills in understanding and applying the scientific method are essential. A specific aim of the research curriculum is to provide dental hygienists with the skills and knowledge to access the most recent and relevant scientific evidence, critically appraise it and determine if it is applicable to the clinical problem being addressed.

A second aim is to enable students to value an evidence-based approach to problem-solving and decision-making.

A third aim is to enable students to interpret the scientific method. A research curriculum must first teach students the elements of scientific inquiry and, second, how to evaluate it qualitatively. Evaluation requires the development of judgment skills; therefore, cognitive as well as affective competencies are addressed in these guidelines.

#### **IV. Primary Educational Goals**

Upon completion of the research curriculum, the student will be able to:

- A. Develop researchable questions for dental hygiene practice problems.
- B. Use critical inquiry and accepted standards for evaluating research trials and systematic reviews (such as CONSORT) to evaluate current dental, dental hygiene and health science research on oral health products, techniques, treatment modalities and issues related to disease risk, prevalence and distribution.
- C. Synthesize knowledge of the scientific research process and how it applies to oral health investigations.
- D. Interpret scientifically sound research approaches to address oral health research questions.
- E. Address the impact of oral health research on society, health care delivery and the practice of dental hygiene and dentistry.
- F. Advocate the need to understand the importance of and maintain ethical and legal behavior throughout the research process.
- G. Support and participate in research activities to enhance the delivery of optimum dental care.
- H. Share research findings through educational diaries, oral and poster presentations, report writing, table clinics and articles.

#### **V. Prerequisites**

Although prerequisites may vary according to academic setting and the educational level of students, the following courses serve as a useful foundation for research curriculum content: college algebra, introduction to computers/scientific database searching, logic, statistics, English/technical writing, scientific writing and communications.

#### **VI. Core Content Outline**

The following major subject areas are suggested for a curriculum in oral health research:

- A. Oral health research, science and the scientific method.
  - 1. Science: purposes and methods.
  - 2. Scientific method: process and concepts.
  - 3. Oral health research: evidence-based approach to systemic problem-solving.



4. Research process, related concepts and terminology.
5. Research problems.
6. Hypotheses.
- B. Literature search: value, approaches and sources.
- C. Types of research and approaches to research.
- D. Legal and ethical concerns in research.
  1. Responsibilities of researcher.
  2. Human subject protection.
  3. Belmont Report.
- E. Control of confounding effects.
  1. Validity.
  2. Threats to internal validity and their control.
  3. Threats to external validity and their control.
  4. Confounding/extraneous variables.
- F. Research design: definition, purpose, types and avoiding bias.
- G. Sampling: purposes, types and their relationship to study design and bias.
- H. Data collection and measurement.
- I. Analysis of research findings.
  1. Ways to organize data: descriptive statistics.
  2. Inferential statistics
    - a. Statistical decision-making.
    - b. Clinical decision-making.
- J. Interpretation of data.
  1. Explanations of data.
  2. Protocol for thorough interpretation.
  3. Clinical versus statistical significance.
- K. Presentation of findings.
  1. Research report format.
  2. Written communication.
  3. Oral presentations.
  4. Poster presentations/table clinics.
- L. Critical analysis of the literature.
  1. Importance of the literature.
  2. Art of criticism.
  3. Criteria used for evaluation.
  4. Elements in the research critique.
- M. Application of research to profession and practice.
  1. Application of an evidence-based decision-making approach to patient care.
  2. Careers in research.

## **VII. Specific Behavioral Objectives**

Upon completion of the research curriculum, the student will be able to:

1. Explain how oral health research and the process of scientific inquiry knowledge development and daily practice.
2. Explain how an evidence-based decision-making approach enhances critical thinking and professional decision-making regarding patient care.
3. Describe the scientific method and research process.
4. Use the Internet and electronic resources in research and understand how they relate to dental hygiene education, practice and research.
5. Conduct an effective literature search using electronic databases (such as PubMed, MEDLINE, CINAHL), professional journals, government documents, product literature and other print publications, video and other forms of multimedia.
6. Develop a PICO (or equivalent) research question to address an identified practice problem.
7. Discuss different research designs and when each is appropriate to use.
8. Explain the elements necessary to obtain valid and reliable results for observational, exploratory and experimental research.
9. Evaluate oral health research articles applying concepts of research design and methodology.
10. Interpret oral health data by proper application of statistical principles and tests.
11. Critically analyze different print and electronic information sources and apply to the practice of dental hygiene.
12. Gain an appreciation for the role of research in evidence-based dental hygiene practice.

## **VIII. Sequencing**

The research course and/or content should follow the basic required dental hygiene courses. The course and/or content should precede opportunities for basic, clinical or field research. Critiquing research articles, writing abstracts, presenting poster sessions and oral presentations, holding table clinics, assisting research faculty and/or developing a research proposal might be used as learning experiences to enhance the didactic portion of the course.

## **IX. Faculty**

Minimum requirements for faculty responsible for didactic and investigative experiences include an interest in, current knowledge of and commitment to critical inquiry and the scientific process. The faculty

should attempt to participate in research opportunities and provide a role model for students.

## **X. Facilities**

No additional facilities are needed other than a well-equipped classroom.

## **XI. Occupational Hazards**

There are no occupational hazards directly related to teaching this course.

## **XII. Educational Strategies**

The research curriculum requires the learner to integrate critical thinking skills, problem-solving and evidence-based decision-making throughout the curriculum sequence. Various education methods can be used to address the cognitive, affective and psychomotor domains to make more meaning for the learner. General educational methods other than lectures could include the use of case study, role-play, team projects, panel or group discussion, debate and interviews. The following list of methods and examples involve individual and group learning.

Content-specific learning activities include:

1. Literature review debate: Compare and contrast evidence presented from a literature review on current scientific advances in the dental profession. Suggested topics include stem cell research, socialized medicine and alternative or advanced practice dental professionals.
2. Patient information portfolio: Create a portfolio of bulleted information pages derived from evidence-based research literature. Main topic pages may be on plaque/biofilm, fluoride, periodontal disease, oral/systemic link and tobacco and tobacco substitutes.
3. Sampling populations: Using M&M'S®, students demonstrate sampling techniques: random, stratified random, systematic and convenience.
4. Evaluation methods: Comparison of qualitative and quantitative methods. A qualitative example may be a descriptive taste comparison of different brands of apple juice. A quantitative example may have students design a 10-question test to administer to a population. Students conduct a pre- and post-test analysis using t-test statistics.
5. Statistical analysis lab activity: Research data input of a given sample population into SPSS, SAS or Excel. Run descriptive analyses to generate tables, charts and graphs.

Learning assessment activities include:

6. Assessing prior knowledge, recall and understanding.
  - a. Open-ended question/answer – Determine the most effective starting point for lectures/activities/class activity.
  - b. Misconception/Preconception Check – Identify information that can be a barrier or interfere with the new knowledge presented in the curriculum. Individual activity.
  - c. Memory Matrix – Self-reflection recall of weekly presented material in lieu of a quiz. Used to assess learner ability to recall and organize learned content. Individual activity.
7. Assessing skill in analysis and critical thinking.
  - a. Pro and Con Grid – Quick overview listing of pros, cons, costs, benefits, advantages or disadvantages of a learning concept. Small group activity or split-class activity.
  - b. Content, Form and Function Outlines – Listed columns to help learning determine the content (what?), form (how?), and function (why?) of a communicative function of a piece of writing film, video or class presentation. Individual activity.
8. Assessing skill in synthesis and creative thinking.
  - a. Concept Maps – Visual self-reflection organization of a given focus concept can be used to assess how the learner makes connections and associations in learning. Individual activity.
9. Assessing skill in problem-solving.
  - a. Problem Recognition Tasks – Ask learners to recognize and identify the particular type of problem within an example and present to the class. Individual or small group activity
  - b. Audio and Videotaped Protocols – Although time consuming, this provides a comprehensive illustration of what a learner would do given a case scenario. Demonstrates the learner's awareness of and control of his own thinking. Individual or peer assessment activity.
10. Assessing students' awareness of their attitudes and values.
  - a. Double-entry Journals – Use to enhance knowledge uptake when reading textbooks. Student journal entries indicate the ideas, assertions and arguments in the assigned readings on one side of a journal and indicate the personal significance of the passage on the other side. Individual activity.
  - b. Everyday Ethical Dilemmas – Students identify, clarify and connect their values by responding to course-related issues and problems that they are likely to encounter. Individual activity.

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## **Dental Hygiene Care for Special Needs Patients**

### **I. Introduction**

Dentistry for the individual with special needs traditionally has focused on groups with a variety of physical, mental, social/emotional and/or medical problems. A patient's status is considered special needs if it requires an alteration in the delivery of dental care. This need can be mild to severe. With increasing emphasis on improving access to dental care for the underserved and on deinstitutionalization, people with special needs seek care in their communities and the dental hygienist must be prepared.

Recent curriculum changes have included people with physical, mental, social/emotional and selected medical conditions under the rubric of special individual, while providing a separate focus for groups such as the elderly or medically compromised. These guidelines will use this categorization, with inclusion of elderly and medically compromised individuals.

Dental hygiene care of the individual with special needs requires specialized knowledge to include understanding of the developmental or acquired condition, limitations to care, communication skills and ability to work collaboratively. The dental hygienist's expertise in expanded duties, community outreach and prevention postures the hygienist to play a vital role on the health care team to provide services for the special needs patient.

### **II. Interrelationship**

This curricular area should be integrated into the student's entire program, both clinically and didactically. No single approach is suggested for accomplishing this, as each school's needs and resources vary.

These guidelines reflect a problem approach to teaching and clinical care consistent with the use of problem-solving teaching strategies and a problem-oriented dental record. Faculty expertise should also reflect this interrelationship, with more than one faculty member serving as a role model for students. Community resources should be invited to participate in the curriculum. The interdisciplinary approach provides a comprehensive, coordinated approach to dental care for individuals with special needs. Applicable subject matter needs to be covered in these areas: behavioral sciences, anatomy and physiology, pathology, pharmacology, oral health education, cultural competence, inter/intra-professional care, community dentistry, ethical considerations and clinical dental hygiene.

### **III. Overview**

The curriculum for dental hygiene care for the special individual should address affective, cognitive and psychomotor learning; hence, objectives in each area must be developed. The need for an inter- and intra-interdisciplinary approach is evident.

The curriculum should include didactic and clinical experiences in the following areas:

- A. Accessibility to care, covering financial, transportation and physical barriers.
- B. Psychosocial attitudes/behaviors and stereotypes.
- C. Medical conditions that may compromise the individual, the provider or affect the type of treatment.
- D. Specific special conditions, their etiology, medical management and characteristic oral findings.
- E. Mobility/stability concerns, including ambulation, uncontrolled movements and uncontrolled behavior.
- F. Communication concerns, including sensory impairments, language levels and social style.
- G. Prevention of dental disease including realistic assessment and planning and implementation strategies.
- H. Continuity of care, including recall and use of community resources and collaboration with other caregivers and health care providers.
- I. Provider philosophy of care, including attitudes, values, problem-solving and decision-making skills.
- J. In addition to being introduced to the problems, students should be provided with resources or experiences to eliminate, reduce or manage the problems. Clinical experiences should be varied and challenging and should develop student confidence in delivering dental care to the special individual.

### **IV. Primary Educational Goals**

Upon satisfactory completion of the dental hygiene curriculum, the student will be able to:

- A. Recognize physical, mental, medical, social and dental needs of people with special needs.
- B. Communicate effectively with individuals with special needs or their caretakers in a positive, appropriate manner.



- C. Adapt dental hygiene procedures and treatment plans to meet the needs of the individuals with special needs, taking into consideration needs, barriers, resources and referrals in keeping with the normalization process.
- D. Communicate and interact with other professionals for the purpose of coordinating care.
- E. Plan, implement and evaluate a community-based prevention program for special individuals
- F. Evaluate state, regional or national trends and legislation for their potential impact on provision of dental care.
- G. Assess one's professional attitudes, values and commitment to providing dental care to special individuals.

## **V. Prerequisites/Corequisites**

Students should have foundation knowledge of general anatomy, physiology and psychology so that comparisons between normal and abnormal growth and development will be understood. Concepts of community dental health, preventive dentistry, oral pathology, pharmacology and individual management will provide a basis for developing realistic and appropriate dental health programs for individuals or groups. Knowledge of pharmacology and medical emergency procedures will facilitate individual safety during clinical procedures. Students should be comfortable performing accepted dental hygiene services so that adaptations in treatment can be introduced as needed. They should examine their attitudes and behaviors toward special needs individuals prior to clinical treatment.

## **VI. Core Content Outline**

Curriculum should include didactic, clinical and/or elective field experiences. Specific areas of the curriculum might be based on community resources available to the school. Because care for special individuals is particularly relevant to dental health projects in many subject areas, the curriculum should be flexible and comprehensive enough to accommodate individual student interests.

### Essential content

- A. Content should include the following characteristics for study of the conditions listed below:
  - 1. General information (disease/condition characteristics, barriers, social style of individual, etc.).
  - 2. Epidemiology.
  - 3. Etiology.
  - 4. Medical management and prevention.
  - 5. Pharmacological considerations.

6. Oral manifestations.
7. Modifications during the dental hygiene process of care.
  - a. Lifespan: Infant-toddler, child, adolescent, preadolescent-post menopausal, adult and geriatric.
  - b. Alcohol-related disorders.
  - c. Allergy.
  - d. Arthritis.
  - e. Autoimmune disease/immune system disorders.
  - f. Bedridden/homebound.
  - g. Bleeding disorders.
  - h. Bloodborne infectious diseases.
  - i. Blood dyscrasias.
  - j. Cancer.
  - k. Cardiovascular disease.
  - l. Cerebral vascular.
  - m. Eating disorders.
  - n. Edentulous
  - o. Liver and kidney disorders.
  - p. Mental/emotional disturbances.
  - q. Mental retardation.
  - r. Metabolic and endocrine disorders.
  - s. Neurological impairment/disorders.
  - t. Organ transplantation.
  - u. Other infectious diseases.
  - v. Respiratory diseases.
  - w. Physically challenged.
  - x. Salivary gland dysfunction.
  - y. Sexually transmitted diseases.
  - z. Specific learning disabilities.
  - aa. Substance abuse.
  - bb. Women's health.
- B. Societal, provider, parental and individual attitudes and biases.
- C. Need and demand for dental care.
- D. Office design and accessibility concerns.
- E. Dental office management procedures.
- F. Community resources.
- G. Individual assessment, both historical and clinical.
- H. Communication and management considerations.
- I. Psycho-social concerns.
- J. Treatment planning and specialty considerations.
- K. Positioning, radiographic and treatment modifications.

- L. Prevention and management of related emergency situations.
- M. Community-based oral health education programs.

## **VII. Behavioral Objectives**

Upon satisfactory completion of required didactic and clinical components, the dental hygiene student will be able to:

- A. Discuss the following characteristics for specific conditions:
  - 1. General information (disease/condition characteristics, barriers, social style of individual, etc.).
  - 2. Epidemiology.
  - 3. Etiology.
  - 4. Medical management and prevention.
  - 5. Pharmacological implications.
  - 6. Oral manifestations.
  - 7. Modifications in the dental hygiene process of care.
- B. Discuss societal attitudes towards individuals with special needs in terms of:
  - 1. Recent legislation.
  - 2. Development of educational programs.
  - 3. Employment options.
  - 4. Provision of dental care.
- C. Analyze his/her attitudes towards special individuals and determine how they might influence provision of care.
- D. Define the term “normalization” and relate it to the provision of dental care to individuals with special needs. Describe individual management techniques that emphasize normalization of care.
- E. Identify roles for community resource people for dental care of individuals with special needs.
- F. Consult with other dental and health professionals in the community when appropriate.
- G. Identify financial problems of individuals with special needs and resources for eliminating the problems.
- H. Discuss potential accessibility problems and solutions that are community-based, provider-based and individual-based.
- I. Suggest office procedures or policies such as appointment scheduling, billing or procurement of information for individuals who may require adaptations.

- J. List/ask important medico-dental history questions for individuals with various special conditions.
- K. Describe psychosocial factors that may influence the ability to seek and receive dental care.
- L. Evaluate dental needs based on collected historical and clinical data.
- M. Determine when dental and management needs are beyond the individual's ability and initiate an appropriate referral.
- N. Identify potential communication problems and identify resources for overcoming them.
- O. Demonstrate verbal and nonverbal communication skills with individuals with special needs.
- P. Describe situations related to special conditions that constitute a medical emergency and the hygienist's role in dealing with them.
- Q. Demonstrate proper use of armamentarium and equipment for providing dental hygiene care to individuals with special needs.
- R. Describe and demonstrate wheelchair transfer techniques.
- S. Describe and demonstrate techniques for stabilizing the individual's body, head and mouth.
- T. Describe mobility problems people with various special conditions encounter in a dental office setting.
- U. Describe or demonstrate alternative radiographic techniques.
- V. Develop individualized oral hygiene plans for selected individuals.
- W. Outline appropriate dental health education approaches for selected individuals.
- X. Based on a needs assessment of a community-based program for individuals with special needs, develop an in-service training program for agency staff and a dental health program.
- Y. Describe oral manifestations of specific conditions and possible causative factors.
- Z. Identify potential roles and practice settings for dental-hygiene work with individuals with special needs.

## **VIII. Sequencing**

As the program progresses, students develop competency in patient management and providing care for patients with more complex needs, requiring special advanced skills. Clinical dental hygiene content and associated dental science courses become augmented in scope and are presented in sequence to facilitate reinforcement of basic concepts integrated with the provision of dental hygiene services. An overview of special conditions should be presented prior to discussion of clinical applications. Students should also analyze their own attitudes prior to clinical contact. Topics such as communication and interviewing, pathology and pharmacology can be introduced in a number of related courses or presented as a separate course. School clinics, off-site clinics (extramural rotations) or community agencies are possible sites for clinical experiences.

## **IX. Faculty**

A team approach is critical to development of a meaningful curriculum; all clinical faculty should participate in at least one in-service session or continuing education course on dental hygiene care for individuals with special needs.

Community resource people involved in the curriculum's didactic or extramural activities should participate as speakers and/or team members. If appropriate, a faculty member with expertise in this area may be designated as a program or content coordinator to ensure that didactic information is current and consistent with clinical experiences.

## **X. Facilities.**

Clinical facilities, reception areas and restrooms of the dental hygiene program should conform to accepted architectural guidelines. These areas should take into consideration special needs, such as wheelchair access, and provide adaptations for access and safety to the fullest extent possible. If clinical facilities are not accessible due to architectural factors or the individual's medical status, care should be provided extramurally through use of portable equipment or at other clinical sites.

## **XI. Occupational Hazards**

Appropriate integration of standard precautions and other state and federal regulatory requirements should be a component of this content area.

## **XII. Educational Strategies**

According to Dental Hygiene Standards (CODA), “faculty should have current background in education theory and practice, concepts relative to the specific topics they are teaching, clinical practice experience and, if applicable, distance education techniques and delivery.” Educational methods for an online or hybrid environment should be included to assure student engagement and student knowledge of assessing and dental hygiene treatment needs for patients with special needs. Student engagement activities may include:

- Student development of case studies related to special needs patients.
- Interprofessional activities between dental hygiene and other health science students and/or other health care professionals in off-campus settings.
- Interactive discussion boards, either synchronous or asynchronous.

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## Dental Radiology

### I. Introduction

Radiology involves the fundamental scientific principles upon which clinical dental radiography is based. Radiology is an integral and mandatory part of the curriculum in all accredited dental assisting and dental hygiene education programs. It is the art and science of recording images of the deep structures of the body on a receptor. This is most commonly achieved by the controlled production of x-rays, which pass through the tissues being imaged and are detected on silver halide film, phosphor plates or digital sensors. Dental radiology is the application of the principles of radiology in the study of the teeth and their surrounding structures. The study of radiology encompasses principles of radiation physics, radiation biology, radiation safety, radiographic quality assurance and imaging theory. Coursework in radiology is not complete without some discussion on alternative imaging modalities and receptors (electronic/digital imaging, computerized tomography, ultrasound, magnetic resonance imaging, etc.).

#### **Definitions:**

- A. Didactic instruction: The portion of the students' education in which the fundamental principles of dental radiology are taught. It is the principle area of concentration for these guidelines.
- B. Preclinical/laboratory instruction: That portion of the students' clinical education during which they perform selected procedures on a laboratory manikin but may not yet be capable of accomplishing similar procedures under the wide variety of conditions encountered in clinic patients. It may follow or run parallel with the didactic radiology course. Basic instruction in radiobiologic effects and radiation protection should be presented prior to any operation of equipment that produces ionizing radiation. If the initial instruction is minimal, radiation biology and radiation health and safety must be presented in greater detail and depth later in the didactic portion of the course.
- C. Clinical instruction: Clinical experiences in which the student working with patients can integrate both didactic and preclinical skills in exposing, processing and evaluating intraoral and extraoral radiographic images. Curricular guidelines for clinical competency by dental hygiene and dental assisting students in dental radiology are the subject of a separate set of guidelines.

### II. Overview

The exposure and processing of dental diagnostic images are most commonly performed by the dental hygienist or dental assistant upon

prescription by a dentist. Preliminary interpretation of radiographic findings should also be completed by dental hygiene and dental assisting students. For dental hygiene students, radiographic assessment should be part of the total assessment phase of the dental hygiene care plan. In view of the scope of practice, dental hygiene students need more extensive education in interpretation skills than dental assisting students.

Knowledge of the scientific principles underlying effective and efficient use of x-radiation will help the student become a self-directed, self-assured practitioner. The student must develop values, attitudes and skills that lead to production of the highest technical quality images with minimal patient and operator exposure.

Moreover, the student must effectively be able to critically evaluate and solve problems encountered in the practice of radiography. Such competency should be promoted during radiology instruction and clinical application.

### **III. Primary Educational Objectives**

Following completion of the curriculum, the student is expected to have an understanding of:

- A. Basic principles and concepts of radiation in general and x-radiation in particular.
- B. Component parts and workings of the dental x-ray machine and the production of x-rays.
- C. Factors affecting the quality of the x-ray beam and the radiographic image.
- D. Effects of ionizing radiation on living tissues.
- E. Radiation biology health and safety.
- F. Radiation protection procedures for the operator and the patient.
- G. Selection of appropriate radiographic surveys, film types and duplicate film use.
- H. Intraoral techniques for bitewings (horizontal and vertical), occlusal films and periapicals, including currently accepted methods and emphasizing the paralleling technique for periapicals.
- I. Supplementary techniques and patient management including endodontic, localization, edentulous, pedodontic and techniques for difficult anatomy and patients with disabling conditions.
- J. Technique of proper film processing, handling and record keeping.
- K. Appropriate infection control considerations and protocols for radiography.
- L. Quality assurance procedures.
- M. Viewing techniques and principles of interpretation.



- N. Panoramic radiography and other extraoral radiographic techniques with instruction in interpretation and component parts as appropriate.
- O. Digital imaging.
- P. Alternate imaging modalities.
- Q. Appearances of normal radiographic landmarks, artifacts and shadows.
- R. Developmental abnormalities and basic disease processes of teeth and supporting structures.
- S. Legal and ethical issues related to dental radiography.

NOTE: The level of competency in interpretation skills should be higher for dental hygiene students than for dental assisting students.

#### **IV. Prerequisites**

Prerequisites for program entry will vary according to the educational setting, but foundational knowledge in physics, biology, anatomy and physiology, oral and head and neck anatomy should be prerequisites or run concurrently.

#### **V. Core Content**

- A. Principles and concepts of radiation.
  - 1. Structure of an atom and theory of ionization.
  - 2. Different sources and types of radiation.
  - 3. Properties of electromagnetic energy.
- B. Component parts and workings of an x-ray machine.
  - 1. Electricity and current.
  - 2. Electrical voltage and transformers.
  - 3. Low- and high-voltage circuits.
  - 4. Components of the control panel.
  - 5. Components of the tube head and function of each.
  - 6. X-ray production.
    - a. Specific function of cathode and anode.
    - b. Thermionic emission.
    - c. Potential difference.
    - d. Electron and target interaction.
    - e. Bremsstrahlung and characteristic radiation.
    - f. Rectification.
  - 7. Interaction with matter.
    - a. Photoelectric.
    - b. Compton effect (modified scatter).
    - c. Thompson effect (unmodified scatter).
    - d. Secondary, scatter radiation.
- C. Quality of the x-ray beam and radiographic image.
  - 1. Beam quality: kVp, filtration, half-value layer (HVL).
  - 2. X-ray quantity: mA, time, distance, collimation.

3. Density.
    - a. Factors affecting density.
    - b. Compensating for changes in exposure factors.
      - i. Distance.
      - ii. Time.
      - iii. MA.
      - iv. kVp.
    - c. Maintaining correct density.
  4. Contrast.
    - a. Factors affecting contrast.
    - b. Reasons for changing contrast.
  5. Definition.
    - a. Factors affecting definition.
    - b. Correcting errors causing poor definition.
  6. Distortion.
    - a. Geometric principles for accurate image formation.
    - b. Recognizing and correcting factors causing distortion.
  7. Processing.
    - a. Film types.
      - i. Nonscreen and screen film.
      - ii. Grids and intensifying screens.
      - iii. Duplicating films.
      - iv. Relative sensitivities to light versus x-rays.
      - v. Latent image.
      - vi. Emulsion.
      - vii. Speed and grain size.
    - b. Chemicals.
      - i. Components and interaction with emulsion.
      - ii. Quality of chemicals.
    - c. Safelights.
      - i. Filters for screen and nonscreen film.
      - ii. Bulb wattage.
      - iii. Distance.
      - iv. Fogging.
    - d. Light leaks.
    - e. Diagnosing cause of poor quality films resulting from processing errors.
  8. Digital images and sensors.
- D. Effects of ionizing radiation on living tissue.
1. Ionization and effects on living tissues
  2. Primary, secondary, scatter radiation
  3. "Critical" organs.
  4. Contraindications for dental radiographs.

- E. Radiation biologic effects.
  - 1. Radiation terminology.
    - a. Roentgen, rad, rem, Curie, Becquerel, Sievert, Gray.
    - b. Exposure, dose.
    - c. Dose response curves: threshold curve, linear response curve.
    - d. Localized dose, whole body dose.
    - e. Shallow dose, deep dose.
    - f. Acute exposure, chronic exposure.
    - g. Somatic effect, genetic effect.
    - h. Additive versus cumulative.
  - 2. Direct and indirect effects.
  - 3. Stochastic and nonstochastic effects.
    - a. Radiosensitivity.
      - i. Tissue.
      - ii. Organ.
      - iii. Cells.
    - b. Primary, secondary, scatter effects.
    - c. Effects of radiation on specific tissues and organs.
  - 4. As low as reasonably achievable (ALARA) concept.
- F. Radiation protection procedures, health and safety.
  - 1. Written policy (operator).
    - a. Maximum permissible dose (MPD) and maximum accumulated dose (MAD).
    - b. Monitoring personnel and maintaining records.
    - c. Operation of equipment.
    - d. Technique and exposure factors.
    - e. Positioning of operator at time of exposure: location and distance.
    - f. Inverse square law.
  - 2. Written policy (patient).
    - a. Selection criteria.
    - b. Operation of equipment.
    - c. Technique and exposure factors.
    - d. Film speed.
    - e. Shielding.
    - f. Equipment performance standards.
    - g. Disinfection of equipment and aseptic technique.
    - h. Record keeping and informed consent.
    - i. Quality assurance of operator competency.
    - j. Supervision.
  - 3. Reduction in patient exposure.
    - a. Equipment update and inspection.
    - b. Filtration.
    - c. Collimation.
    - d. Timing devices.
    - e. Position indicating devices.

- f. Film and/or film/screen combinations.
  - g. Shields.
  - h. Technique.
  - i. Processing.
  - j. Quality assurance.
  - k. Film handling, mounting and viewing techniques.
  - l. Professional judgment and ethics.
  - m. Retake policy.
- 4. Reduction in operator exposure.
  - a. Maximum permissible dose.
    - i. Yearly and quarterly.
    - ii. Occupationally exposed.
    - iii. Nonoccupationally exposed.
    - iv. Pregnancy.
    - v. Accumulated lifetime.
  - b. Personnel monitoring systems.
  - c. Office design.
    - i. Barriers and materials.
    - ii. Location of equipment.
    - iii. Position of operator during exposure.
    - iv. Equipment update and inspection.
- G. Selection of surveys, image receptor and record keeping.
  - 1. Determination of diagnostic purpose of exposures.
    - a. High yield selection of criteria.
    - b. Baseline data determination.
    - c. Diagnosis.
    - d. Use in treatment.
  - 2. Selection of the appropriate survey or combination of surveys (bitewings, periapicals, occlusal, panoramic, cephalometric, cone-beam, etc.).
    - a. Assessment of patient's radiation history.
    - b. Usefulness of preexisting radiographs.
    - c. Consideration of alternate diagnostic tools.
    - d. Anatomical structures to be examined.
    - e. Patient's ability to be radiographed (challenging anatomy, disabling conditions, etc.).
  - 3. Selection of appropriate image receptor (film/sensor).
    - a. Size.
    - b. Screen/nonscreen film.
    - c. Proper screen/film combination.
    - d. Use of duplicate film when appropriate.
      - i. Double pack film.
      - ii. Use of duplicating film.
  - 4. Record keeping and duplicating.
    - a. Permanent records, signed, dated and in ink.

- i. Patient history: medical and radiation.
    - ii. Purpose of radiographs.
    - iii. Informed consent.
    - iv. History of exposure.
      - a) Dates.
      - b) Number of images (including retakes).
      - c) Orientation permanently incorporated as part of the image for identification purposes.
  - b. Transfer of records to other dental personnel.
    - i. Duplicate films.
    - ii. Request from patient or other dental personnel.
    - iii. Record of transfer.
  - c. Record of patient history of exposure.
    - i. Dates.
    - ii. Number of images (including retakes).
- H. Intraoral techniques.
  - 1. Film/receptor sizes and selection.
  - 2. Components of film packet/types of receptors.
  - 3. Interproximal.
    - a. Purpose (horizontal and vertical).
    - b. Technique: film, film holders, receptor holders and alternate techniques.
    - c. Positioning of film/receptor, patient and tube.
    - d. Exposure factors.
    - e. Criteria for good diagnostic quality image.
    - f. Recognizing and correcting errors.
  - 4. Occlusal.
    - a. Purpose.
    - b. Technique: topographical, cross-sectional.
    - c. Positioning of film, patient and tube head.
    - d. Exposure factors.
    - e. Criteria for good diagnostic quality of film.
    - f. Recognizing and correcting errors.
  - 5. Periapical.
    - a. Purpose.
    - b. Parallelizing (recommended).
      - i. Principles.
      - ii. Image quality and patient exposure.
      - iii. Exposure factors.
      - iv. Receptor, holding devices.
    - c. Bisecting angle (adjunctive).
      - i. Principles.
      - ii. Image quality and patient exposure.
      - iii. Exposure factors.
      - iv. Receptor, holding devices.

- d. Criteria for diagnostic quality exposures.
  - e. Recognizing and correcting errors.
- 6. Mounting.
  - a. Purpose.
  - b. Procedure manual (labial and lingual mounting), computerized.
  - c. Labeling and storing.
- I. Supplemental techniques.
  - 1. Patient management.
    - a. Consent.
    - b. Cooperation.
    - c. Positive medical history.
    - d. High gag reflex.
  - 2. Patients with special conditions.
    - a. Shallow palate or floor of mouth.
    - b. High lingual frena.
    - c. Tori.
    - d. Excessive length of dental roots.
    - e. Canine overlap.
    - f. Trismus.
    - g. Special needs or disabled patients.
  - 3. Pedodontic surveys.
    - a. Choice of survey.
      - i. Number of exposures.
      - ii. Size and type of receptors.
    - b. Patient management.
    - c. Exposure factor modification, proper MA, time, kVp.
  - 4. Edentulous surveys.
    - a. Choice of survey.
    - b. Technique.
      - i. Number of exposures.
      - ii. Areas to be exposed.
      - iii. Type and size of receptor.
    - c. Exposure factor modification, proper MA, time, kVp.
  - 5. Endodontic.
    - a. Purpose.
    - b. Instruments.
    - c. Technique.
  - 6. Deliberate displacement (of receptor).
    - a. Mandibular third molars.
    - b. Difficult anatomy.
  - 7. Localization of objects.
    - a. Purpose.
    - b. Techniques.
      - i. Right-angle method (Miller's technique).
      - ii. Tube-shift method (Clark's technique/SLOB Rule).

- iii. Buccal-object rule.
  - c. Types of receptors.
  - d. Diagnosing angulation mistakes.
  - e. Principle for maxillary third molar projections (and other anatomical structures intentionally).
- J. Film processing, handling and storing.
  - 1. Manual processing (if included in the curriculum).
    - a. Time and temperature.
    - b. Equipment.
    - c. Mixing chemicals.
    - d. Location of chemicals, tanks and maintenance.
    - e. Technique.
    - f. Recognizing and correcting processing errors.
  - 2. Automatic processing.
    - a. Operation and maintenance of processor.
    - b. Troubleshooting equipment problems.
    - c. Recognizing and correcting processing errors.
    - d. Quality assurance.
  - 3. Mounting, labeling and storing films.
- K. Quality assurance.
  - 1. Darkroom.
    - a. Safelights.
    - b. Light leaks.
    - c. Processing chemicals.
  - 2. Equipment.
    - a. Beam diameter and alignment.
    - b. Radiation output from each unit.
  - 3. Equipment inspection.
- L. Viewing techniques and principles of interpretation.
  - 1. Viewing.
    - a. Quality of images.
    - b. Proper mounts.
    - c. Appropriate viewboxes and/or computer terminals.
    - d. Proper environment.
    - e. Viewing aids.
      - i. Magnifying glass.
      - ii. Variable intensity light.
      - iii. Duplication of dark films.
    - f. Supplemental views and images.
  - 2. Interpretation principles
    - a. Radiolucencies
      - i. Borders: none, indistinct, distinct, smooth or ragged.
      - ii. Shape: singular or multiple, unilocular or multilocular, symmetry, size.
      - iii. Pattern: radiopaque flecks, no flecks.

- iv. Location: coronal, periapical, medullary, monostotic or polyostotic.
  - b. Radiopacities.
    - i. Borders: corticated, noncorticated.
    - ii. Shape: single or multiple, symmetry, size.
    - iii. Pattern; localized, generalized, diffuse.
    - iv. Location: periapical, medullary, outside jaws.
  - c. Mixed radiolucencies-radiopacities.
    - i. Borders: none, indistinct, distinct, smooth or ragged.
    - ii. Shape: singular or multiple, unilocular or multilocular, symmetry, size.
    - iii. Pattern: radiopaque fleck, no flecks.
    - iv. Location: coronal, periapical, medullary, monostotic or polyostotic.
  - d. Dimensional changes.
  - e. Alterations in outer cortex.
  - f. Involvement of supporting structures of teeth.
  - g. Association with teeth.
- M. Panoramic radiography and other extraoral techniques.
  - 1. Panoramic theory.
    - a. Film/screen combination.
    - b. Rotation theory.
    - c. Patient exposure.
    - d. Advantages and disadvantages.
  - 2. Panoramic techniques.
    - a. Specialized equipment.
    - b. Patient positioning.
    - c. Film handling.
  - 3. Panoramic interpretation.
    - a. Shadows and artifacts.
    - b. Normal anatomy and landmarks.
    - c. Principles of interpretation.
  - 4. Lateral jaw radiography.
    - a. Purpose.
    - b. Techniques.
    - c. Anatomy and interpretation.
  - 5. Skull radiography.
    - a. Purpose.
      - i. Cephalometric.
      - ii. Paranasal sinus.
    - b. Technique.
  - 6. Temporomandibular joint.
    - a. Purpose.
    - b. Techniques.
  - 7. Radiography for implants.



N. Digital imaging.

1. Direct and indirect digital imaging.
2. Digital imaging systems.
  - a. charged-couple device (CCD).
  - b. Photostimulable phosphors (PSP).
  - c. Complementary metal-oxide semiconductor (cmos).
  - d. Cone beam computed tomography (CBCT)
3. Advantages and disadvantages.
4. Technique.
5. Mounting.

O. Alternate imaging modalities and definitions.

1. Use of contrast media (arthrography, sialography, etc.).
2. Computerized tomography.
3. Nuclear medicine imaging.
4. Magnetic resonance imaging.
5. Subtraction techniques.

P. Dental diseases.

1. Periodontal disease interpretation.
  - a. Limitations.
  - b. Crestal irregularities.
  - c. Interdental septal bone changes.
  - d. Bone loss: direction, location, amount.
  - e. Local irritants.
    - i. Calculus.
    - ii. Faulty restorations.
  - f. Periodontal trauma.
  - g. Standardization of "in treatment" radiographs.
2. Dental caries and restorations interpretation.
  - a. Limitations.
  - b. Locations: interproximal, occlusal, cemental, recurrent.
  - c. Optical illusions.
    - i. Size and shape.
    - ii. Cervical burnout.
    - iii. Mach band effect.
    - iv. Restorative materials.
    - v. Technique errors.
    - vi. Defects in enamel or root.
3. Pulpal interpretation.
  - a. Size.
  - b. Secondary and sclerotic dentin.
  - c. Pulp stones/calcifications.
  - d. Vital and nonvital conditions.
4. Periapical interpretation.
  - a. Hypercementosis.
  - b. Internal and external resorption.

- c. Changes in periodontal membrane space.
  - d. Periapical radiolucencies.
  - e. Periapical radiopacities.
  - f. In lamina dura.
  - g. Root canal filling materials.
- Q. Normal anatomy and shadows.
- 1. Relativity of the terms “radiopaque” and “radiolucent.”
  - 2. Structural differentiation.
    - a. Enamel.
    - b. Dentin.
    - c. Cementum.
    - d. Pulp.
    - e. Periodontal ligament space.
    - f. Alveolar process.
      - i. Lamina dura.
      - ii. Cortical plates.
      - iii. Cancellous bone and trabecular pattern.
    - g. Nutrient canals.
    - h. Gingivae.
    - i. Foreign materials.
  - 3. Maxillary anatomic landmarks.
    - a. Median maxillary suture (median palatine suture).
    - b. Incisive canal, fossa, and foramen.
    - c. Superior foramen of incisive canal.
    - d. Anterior nasal spine.
    - e. Nasal fossae.
    - f. Nasal septum, turbinates or conchae.
    - g. Naso-lacrymal canals.
    - h. Zygomatic arch.
    - i. Malar process or zygomatic process of the maxilla.
    - j. Junction of lateral wall and floor of nasal cavity.
    - k. Maxillary sinus or antrum.
    - l. Septa in maxillary sinus.
    - m. Maxillary tuberosity.
    - n. Coronoid process of mandible (seen on maxillary third molar periapical radiograph).
    - o. Hamulus (hamular process of medial pterygoid plate).
    - p. Lateral pterygoid plate.
  - 4. Other maxillary shadows.
    - a. Tip of nose, ala of nose.
    - b. Upper lip.
    - c. Lateral/canine fossa.
    - d. Nasolabial fold.
    - e. Sinus recesses, nutrient canals.
    - f. Pneumatization.
    - g. Palatal torus.

5. Mandibular landmarks.
  - a. Lingual foramen or groove.
  - b. Lingual canal.
  - c. Genial tubercles.
  - d. Inferior cortex of mandible.
  - e. Mental ridges.
  - f. Mandibular canal.
  - g. Mental foramen.
  - h. Mandibular foramen (on extraoral radiographs).
  - i. External oblique ridge.
  - j. Mylohyoid ridge, internal oblique ridge.
  - k. Submandibular fossa.
  - l. Mandibular ramus and coronoid process.
  - m. Mandibular condyle (on extraoral radiographs).
6. Other mandibular shadows.
  - a. Lower lip.
  - b. Tongue.
  - c. Retromolar triangle.
  - d. Mandibular tori.
7. Anatomic variations that mimic pathology (for example, dental papilla of incompletely formed apices, sinus recesses, trabecular patterns, etc.).
8. Projection artifacts (superimpositions).
9. Dental restorative materials.
- R. Developmental and acquired abnormalities.
  1. Variations in morphology.
    - a. Microdontia and macrodontia.
    - b. Gemination, fusion and concrescence.
    - c. Supernumerary roots, dilacerations.
    - d. Taurodontia, dens invaginatus, dens evaginatus.
    - e. Enamel pearls, talon cusps.
    - f. Radiation stunting.
  2. Variations in numbers: anodontia, hypodontia, hyperdontia, supernumerary teeth, mesiodens.
  3. Variations in structure.
    - a. Enamel hypoplasia.
    - b. Amelogenesis imperfect.
    - c. Dentinogenesis imperfect.
    - d. Dentin dysplasia.
    - e. Regional odontodysplasia.
  4. Variations in eruption.
    - a. Drift and migration.
    - b. Transposition and ectopic eruption.
    - c. Impaction.
    - d. Delayed eruption.
  5. Variations of the jaws: tori, clefts, exostoses, enostoses.

6. Acquired variations.
  - a. Attrition.
  - b. Abrasion.
  - c. Erosion.
  - d. Retained roots.
  - e. Foreign bodies.
- S. Legal issues in dental radiography.
  1. Ownership of radiographs.
    - a. Billing.
    - b. Loaning or transfer of records.
  2. Liability for nonuse of radiographs.
  3. Radiographs as evidence.
    - a. Permanent identification of radiographs.
  4. Forensic use.
    - a. Identification.
    - b. Personal injury.
    - c. Malpractice.
    - d. Child abuse.
  5. Consumer Radiation Health and Safety Act of 1981.
    - a. Equipment certification and inspection.
    - b. Operator certification.
    - c. Educational accreditation.
  6. National Council on Radiation Protection and Measurements (NCRP) Report No. 145, *Radiation Protection in Dentistry*, 2003.
  7. State and federal regulations.
- T. Infection control in radiology.
  1. General principles.
  2. Procedures.

## VI. Behavioral Objectives

Upon completion of the course, the student should be able to explain:

- A. Physical principles of x-radiation used in dentistry.
  1. Properties of x-radiation.
    - a. Know the development of the role of radiology in modern dentistry.
    - b. Properly relate radiology with diagnosis, treatment planning and other phases of the dental hygiene process of care.
    - c. Describe the physical nature of electromagnetic energy.
    - d. Describe how those properties of ionizing radiation relate to its use in dentistry.
  2. X-radiation production.
    - a. Discuss atomic structure in sufficient detail to provide an understanding of x-radiation production.
    - b. Describe the factors and circumstances necessary for x-ray production.

- c. Describe the primary components of a simplified x-ray unit and how they function to affect the x-ray beam.
  - d. Explain how x-radiation is produced.
  - e. Differentiate between x- and other forms of ionizing radiation.
- 3. X-radiation units, detection and measurement devices.
  - a. Define the following terms: ionization, roentgen, rad, exposure, dose, exposure rate, RBE, rem, Curie, Gray, Sievert and Becquerel.
  - b. Identify some of the instruments used in detection and measurement of x-radiation.
- 4. X-ray beam quality and quantity.
  - a. Describe what is meant by radiation quality and quantity.
  - b. Identify those x-ray generator factors that influence quality and/or quantity.
  - c. Describe how quality and quantity are measured and how they affect the radiographic image.
  - d. Comprehend thoroughly the processes involved during the manipulation of various dials and switches on a dental x-ray unit control panel.
- 5. Arithmetics of exposure.
  - a. Describe accurately the interrelationships of various exposure factors (time, kVP, MA, PID length, patient size, film speed, processing).
  - b. Relate this information to practical clinical situations in which these variables can differ.
- 6. Interaction of x-radiation with matter.
  - a. Describe the interaction of x-radiation with matter using simplified diagrams of atomic structure to relate atomic number, mass and thickness to the x-ray attenuating ability of a substance.
  - b. Describe the most common ways by which x-radiation interacts with matter, such as no interaction, Thompson scatter (coherent scatter), photoelectric effect and Compton scatter.
- 7. Production and quality of x-radiation scatter.
  - a. Describe the concept of half-value layer (HVL) with regard to x-ray beam quality and the basic method by which it is determined.
  - b. Discuss factors related to the production of scattered (secondary) radiation.
- B. Radiobiological concepts related to dentistry.
  - 1. Biological effects of ionizing radiation (general concepts).
    - a. Recognize that any dose of radiation, no matter how small, may have a biological effect.
    - b. Recognize that biological effects are caused by all types of ionizing radiation.
    - c. Recognize and describe differences in biological effects produced by particulate versus electromagnetic radiation.
    - d. Describe the direct and indirect theories of biological effects.

- e. Discuss the critical organ concept and the rationale of the maximum permissible dose (MPD) limits.
  - f. List differences in radiosensitivity among organs, tissues and species.
- 2. Factors influencing a biological response to ionizing radiation.
  - a. Discuss linear energy transfer (LET).
  - b. Discuss in general terms the physical, chemical and biological circumstances influencing the response of tissue to ionizing radiation.
  - c. Discuss in greater detail conditions that relate directly to dental irradiation.
- 3. Somatic, genetic and carcinogenic effects of radiation exposure.
  - a. Define the terms "somatic effects," "genetic effects" and "carcinogenic effects."
  - b. List differences in the production of biologic effects by high- and low-level exposures to radiation.
  - c. Describe the rationale of the maximum permissible dose (MPD) for occupationally and nonoccupationally exposed individuals.
  - d. Identify the types of genetic effects radiation exposure may produce.
  - e. Recognize low-level radiation exposure as one of the many factors in environmental contamination.
  - f. Identify and discuss factors in assessing increased risk of neoplasia following exposure to ionizing radiation at doses commonly used in dentistry and medicine.
- C. Principles of radiological health.
  - 1. General considerations related to radiological health.
    - a. List potential sources and types of radiation exposure.
    - b. Discuss the wide variety of applications for ionizing radiation in health science.
    - c. Demonstrate concern for and understanding of the public health implications of exposure.
    - d. Be conversant about basic principles of radiation protection, including radiograph selection criteria.
  - 2. Radiation protection methods in the dental office.
    - a. Describe currently acceptable methods for reducing x-radiation exposure of the patient and occupationally and nonoccupationally exposed dental office personnel.
    - b. Recognize the need for a high diagnostic yield when using x-radiation.
    - c. Associate physical principles of x-radiation and radiobiological concepts to the necessity of reducing x-radiation exposure in the dental office.
    - d. Define the ALARA principle.
- D. Radiographic technique.
  - 1. Intraoral.
    - a. Use appropriate intraoral radiographic techniques in receptor placement, angulation and exposure factors.

- b. Produce complete mouth radiographic surveys for adult dentulous patients presenting simple management problems.
  - c. Properly mount all radiographs.
  - d. Evaluate all exposures in terms of technical quality, accuracy and diagnostic acceptability.
  - e. Identify all radiographic errors (exposure and processing) and describe the best methods for correcting them.
  - f. Apply basic principles of projection geometry and exposure to produce diagnostically acceptable exposures for adult patients using other than the recommended procedures covered above. (It is assumed that students will apply these skills on patients presenting moderate to complex management problems.)
  - g. Be able to evaluate, select or appropriately modify previously discussed techniques to radiograph children, edentulous and endodontic patients.
  - h. Describe techniques of occlusal radiography and identify and discuss clinical indications for making occlusal exposures.
  - i. Discuss various methods of managing patients presenting with special problems.
  - j. Describe and use clinically those radiographic procedures useful in locating objects within or adjacent to the mandible and/or maxilla.
  - k. Identify clinical circumstances in which nontraditional/miscellaneous intraoral radiographic projections may be useful.
  - l. Describe general considerations for application of infection control principles in radiography facilities.
2. Extraoral.
- a. Discuss clinical indications for and understand basic methods used in taking:
    - i. Lateral oblique views of the mandible and maxilla.
    - ii. A posterior-anterior view of the mandible.
    - iii. Occlusal exposure techniques.
    - iv. Panoramic and cephalometric projections.
    - v. Projections for implants.
  - b. Demonstrate ability to use panoramic radiographic equipment and take diagnostically acceptable radiographs on a variety of patients.
  - c. Discuss principles of panoramic radiography and the advantages and disadvantages of panoramic radiography compared to intraoral radiographic surveys.
  - d. Discuss basic concepts of cephalometric radiography.
  - e. Discuss panoramic and cephalometric radiographs in terms of their clinical usefulness, image quality and anatomic structures portrayed.
- E. X-ray films, sensors, intensifying screens.
1. X-Ray film characteristics.
- a. Describe these radiographic image characteristics: Density and speed as they relate to film, contrast and definition.

- b. Name the component parts of x-ray film and discuss similarities and differences among various speeds of film.
- 2. Sensors.
  - a. Describe and differentiate the different types of digital sensor systems.
- 3. Intraoral and extraoral films and intensifying screens.
  - a. Describe various films available for intraoral and extraoral radiography.
  - b. Indicate numerical and alphabetical designations for such films.
  - c. Compare and contrast differences between extraoral and intraoral film speeds.
  - d. Describe purposes and relative sensitivity of various intensifying screens and film/screen combinations.
  - e. Discuss types of intraoral film packets/sensors, extraoral cassettes and holding devices available for clinical radiography.
  - f. Discuss latent image formation.
  - g. Discuss current developments in radiographic imaging such as electronic/digital imaging, computerized tomography, magnetic resonance imaging and ultrasound.
- 4. Factors contributing to radiographic image quality.
  - a. List effects of factors contributing to radiographic image quality: density, contrast, definition, distortion, detail and resolution.
- 5. Factors influencing radiographic density.
  - a. Discuss factors contributing to density and relate these factors to the production of intraoral and extraoral exposures.
- 6. Factors influencing radiographic contrast.
  - a. Describe the term "radiographic contrast."
  - b. Discuss factors contributing to contrast in the diagnostic radiograph.
  - c. Discuss the relationship of these factors to production and interpretation of intra and extraoral images
  - d. Discuss the importance of proper viewing conditions to enhance perception of contrast.
- 7. Factors influencing radiographic definition and distortion.
  - a. Define and differentiate between the terms definition and distortion.
  - b. Identify factors that affect definition and distortion on a diagnostic radiographic image and relate these factors to the principles of intraoral and extraoral techniques.
  - c. Discuss clinical radiographic images based on density, contrast, definition and distortion.
- F. Image processing.
  - 1. Darkroom construction, equipment and safelighting.
    - a. Describe the essential items of darkroom equipment.
    - b. Know the optimal arrangement of a private office darkroom.
    - c. Describe factors to consider in selecting a safelight for the darkroom, depending on types of films to be used.



- d. Describe tests useful in detecting excess darkroom light (safelight and/or light leaks).
- 2. Care of darkroom including changing and replenishing solutions.
  - a. Discuss importance of cleanliness and orderliness.
  - b. Discuss the rationale of daily tank and solution care and maintenance.
  - c. Describe the mechanical components and operation of automatic processors.
  - d. List factors that influence the life expectancy of processing solutions.
  - e. Identify methods for film and solution inventory and proper disposal of spent solutions.
- 3. Film identification, processing technique, solution chemistry and darkroom error.
  - a. Discuss the relationship between latent image formation and processing procedure.
  - b. Describe film processing procedures.
  - c. Identify the portion of the processing cycle when "white light" must be nonexistent.
  - d. Identify principle chemical components of processing solutions.
  - e. Describe functions of each component on exposed and unexposed portions of the film.
  - f. Discuss and identify effects of darkroom errors on diagnostic radiographs, including those that produce film fog and processing artifacts.
  - g. Identify major types of processing errors and identify potential cause and appropriate remedy.
  - h. Discuss essential differences between manual and automatic film processing and the advantages and disadvantages of each.
  - i. Describe a procedure for permanent identification of radiographs.
- 4. Quality assurance administration.
  - a. Describe the procedures, tests and records needed to maintain an effective radiographic quality assurance program.
- G. Normal radiographic appearances of teeth and jaws; variations within the normal.
  - 1. Alveolar process.
    - a. Recognize common normal variations in bone patterns of the mandible and maxilla including radiographic differences between cortical/compact and cancellous bone.
  - 2. Alveolar bone crest.
    - a. Identify characteristics of the crest.
    - b. Recognize the effect of variations in tooth contour and inclination on the radiopacity and shape of the crest as viewed on a radiograph.
  - 3. Normal radiographic appearance of the anatomical structure and conditions.

- a. Identify common anatomic structures on panoramic and periapical radiographs visible in normal, developing and mature individuals.
  - b. Recognize the normal radiographic appearance of developing and mature teeth and their supporting tissues.
  - c. Recognize the radiographic appearance of the teeth and jaws due to anatomic factors.
- 4. Developmental abnormalities of teeth and jaws.
  - a. Recognize the following conditions radiographically.
    - i. Variation in the number of teeth.
    - ii. Variation in shape of teeth.
    - iii. Anomalies in tooth structure.
    - iv. Transposition.
    - v. Delayed eruption and impaction.
    - vi. Acquired variations.
    - vii. Clefts of the palate and jaws.
    - viii. Tori.
- H. Use of radiographs in periodontal diagnosis.
  - 1. Describe the limitations and benefits of radiographs in determining a periodontal diagnosis.
  - 2. Discuss the use of radiographs in periodontics.
  - 3. Recognize radiographic changes associated with early, moderate and advanced stages of periodontal disease.
  - 4. Recognize contributing factors to periodontal disease such as calculus, restorations, root proximity and malposition of teeth.
- I. Radiographic diagnosis of dental caries and restorations.
  - 1. Recognize dental caries.
  - 2. Identify common errors in interpretation of dental caries.
  - 3. Recognize radiographic appearance of common temporary and permanent restorations made from metallic, synthetic and porcelain restorative materials, in addition to materials used as bases and luting agents.
  - 4. Recognize common deficiencies in proximal restorations, including contour, overhanging and deficient margins and defective restorations.
- J. Radiographic appearance of the pulp chamber and periapical disease.
  - 1. Identify variations that can occur within a normal pulp chamber and the adjacent periapical tissues as a result of inflammation or neoplastic processes.
  - 2. Recognize various root canal filling materials, pulpal calcifications, hypercementosis, root resorption, periapical radiolucency and radiopacity and internal/external resorption.

## VII. Clinical Radiology for Dental Hygiene Education

These guidelines for clinical competency in dental radiography are intended to supplement the *Curriculum Guidelines for Dental Radiography for Dental Hygiene and Dental Assisting Education* by emphasizing the clinical competencies to be achieved in this subject rather than the didactic curricular content.

### Definitions:

- A. Clinical competency: The minimal skills, knowledge and values needed by the dental hygienist/assistant as they enter their professions to safely expose, process, evaluate and interpret diagnostically acceptable intraoral and extraoral exposures on patients.
- B. Preclinical competency: The skills, knowledge and values needed by the dental hygiene/assisting student in the laboratory/preclinical setting in order to prepare them for treating patients. Selected procedures are performed on manikins. Students must successfully complete these procedures before they treat the wide variety of conditions encountered with clinic patients.
- C. Foundational knowledge: That portion of the dental hygienists'/assistants' education in which fundamental scientific principles of dental radiography are taught and learned.  
Interrelationship: The ability to integrate radiographic theory and clinical skills and apply both to the clinical setting is an essential component of the dental hygiene process of care. Clinical dental radiography involves procedures generally performed by the dental hygienist/assistant and is an integral and mandatory part of the curricula in all accredited dental hygiene and dental assisting programs.

### Overview:

The exposure and processing of dental diagnostic images are most commonly performed by the dental hygienist or assistant, whereas the prescription of radiographs and diagnostic interpretation are the responsibility of the dentist. In view of the scope of their practice, dental hygiene students need more extensive education in interpretation skills than dental assisting students. The curriculum must be broad enough to include cognitive, psychomotor and affective skills that foster decision-making and problem-solving skills while managing patients encountered in the practice of dental radiography. Knowledge of the scientific principles underlying effective and efficient use of x-radiation will help develop a self-directed, self-assessing practitioner. Students must

develop values, attitudes and skills that lead to the production of the highest technical quality radiographs with minimum patient and operator exposure. Clinical experiences should provide opportunities to achieve these competencies.

**Primary educational objectives:**

Following completion of the curriculum, the student is expected to:

1. Follow accepted principles of radiation hygiene that are based on an understanding of radiation biology.
2. Employ the basic principles of radiographic theory.
3. Employ appropriate methods (including digital radiography, where available) for intraoral and extraoral radiography and be capable of modifying procedures to meet specific clinical situations.
4. Design and use a radiographic quality assurance program appropriate for the needs of a specific practice setting.
5. Use critical thinking skills to self-assess and correct technique, exposure and processing errors.
6. Identify all normal anatomic structures, deviations from normal and artifacts present on intraoral and extraoral exposures.
7. Dental hygiene: Interpret radiographs for health and disease.
8. Dental hygiene: Appropriately integrate radiographs into the dental hygiene process of care.

**Prerequisites:**

Prerequisites for clinical dental radiography will vary according to the educational setting; a knowledge of dental and skull anatomy would be beneficial.

**Core content outline:**

The following are major skills essential to all dental hygienists/assistants who expose radiographic images.

1. Clinical application of foundational knowledge.
2. Radiographic technique skills.
3. Image processing skills (film and digital).
4. Radiographic interpretive skills.
5. Patient communication and management skills.
6. Professional behavior.

### **Behavioral Objectives:**

At the completion of the dental radiology curriculum, the dental hygienist/assistant should be able to do the following.

#### **A. Clinically apply foundational knowledge.**

1. Review and document the dental and medical history with the patient; perform a clinical evaluation to assess the patient's needs prior to beginning prescribed radiographic procedures; and determine deviations from normal, which might influence the radiographic procedure.
2. Follow recommended principles of radiographic safety and hygiene using the ALARA principle.
  - a. Obtain a complete radiological history to determine exposure from medical, dental, therapeutic and occupational sources.
  - b. For pregnant patients, address patient concerns about safety with accurate and up-to-date information based on the latest scientific evidence.
  - c. Verify the availability of recent radiographs taken by another dentist.
  - d. Use appropriate rectangular collimation, filtration and exposure factors.
  - e. Use appropriate lead apron and thyroid shield on patients, and use suitable barriers, distance and positions while making exposures.
3. Employ basic principles of radiographic theory during the radiographic procedure and modify standard procedures based on clinical findings or when radiographs using the primary technique are unobtainable.
4. Apply standard precautions to dental radiographic procedures for the patient or the operator.
5. Document all pertinent radiographic exposure factors in the patient's record. Include the date, recommendations and signature of the prescribing dentist, the number and type of radiographs, retakes if applicable and the signatures of the student clinician and supervising faculty member/dentist.

#### **B. Radiographic techniques.**

1. Choose the most appropriate method for intraoral radiography, but with enough flexibility to modify the procedure as the situation requires, as when patients are young, gag easily or have tori. The

techniques of choice are the paralleling technique using a beam alignment device, using an 8"–12" receptor to focal spot distance, rectangular beam collimation and fast speed receptor (F speed film or digital imaging). Other techniques minimizing patient exposure are also encouraged.

2. Possess the skills necessary to expose diagnostically acceptable radiographs.
3. Seek assistance with technical skills when unable to make necessary adjustments to technique.
4. Complete radiographic procedures in a reasonable amount of time as defined by the individual program.
5. Produce radiographs of acceptable diagnostic quality with proper contrast, density, definition and minimal magnification or anatomic distortion. Competency is determined by each individual program. For example, produce four consecutive diagnostically acceptable full-mouth surveys with no greater than two retakes.
6. Evaluate individual projections (or images) and surveys for diagnostic acceptability (as defined by each individual program) and determine the need for retakes.
7. Critically evaluate, in writing or verbally, individual projections and radiographic surveys and indicate the proper method(s) for correction. When an error is identified, the dental hygienist/assistant will modify packet placement and tube head alignment for correction.

C. Film processing skills.

1. Evaluate the darkroom for white light leaks, appropriate safe lighting conditions and availability of essential equipment for time-temperature and automatic processing. This would include items such as film carriages, timer, thermometer, stirring rods, time-temp processing chart and water flow controls.
2. Prepare and maintain processing solutions for both manual and automatic film processing equipment.
3. Use recognized film processing techniques, consistently producing radiographs free of processing errors.
4. Take prompt corrective action to eliminate or minimize processing errors once they appear on radiographs.
5. Develop and continuously monitor a quality assurance program for production of acceptable diagnostic quality radiographs with minimum film exposure to x-radiation.
6. Monitor film storage to minimize film fog.

D. Digital processing skills.

1. Lighting should be subdued in the room prior to opening barrier bags with exposed PSP receptors.
2. Exposed PSP receptors should be removed from the barrier bag and dropped immediately into a light protected container.
3. Exposed PSP receptors in the light protected container should be loaded into the scanner in a low-lit room with the active phosphor side facing the drum.
4. Once scanned, receptors should be cleared of images prior to reuse by exposing to light for a minimum of two minutes.
5. Inspect receptors for scratches or other artifacts that may affect the image prior to rebagging for use.
6. If possible, sterilize PSP receptors using ethylene oxide. A high level of disinfection should be used.

E. Radiographic interpretive skills.

7. Follow appropriate exposure, processing and image viewing factors necessary for proper radiographic interpretation.
8. Identify all normal anatomic structures and artifacts visible on radiographs and panoramic images.
9. Identify deviations in radiographic form and density from normal structures on all radiographs taken.
10. Interpret all radiographs for normal and abnormal.

D. Patient communication and management skills.

1. Monitor patient's reactions, consider patient comfort throughout the radiographic procedure and respond appropriately to the patient's verbal and nonverbal communication.
2. Promote an atmosphere of mutual trust with patients and respond to patient concerns about safety with knowledge based on factual information, scientific data and sound reasoning.

## VIII. Sequencing

The most appropriate time for didactic instruction in dental radiography will depend on program length and structure. The basic didactic radiology course should precede the preclinical course in radiography. Didactic training in radiation biology and protection should precede the preclinical laboratory experience. Students should demonstrate competency on manikins prior to radiographic exposure on patients.

The most appropriate time for attaining clinical competency in dental radiography will depend on the program and on available facilities. The basic didactic radiology course should precede or run concurrently with preclinical laboratory experiences performed on manikins. Foundational knowledge in radiation safety and hygiene should precede any radiographic exposure made by students and competency on manikins should precede experiences with patients.

## **IX. Faculty**

Role-model learning is extremely important in radiology. Faculty should have additional training in dental radiology beyond that provided by undergraduate dental hygiene and dental assisting education programs and clinical practice. In addition, they should have background in educational methodology, clinical and didactic assessment.

Faculty should have additional education in dental radiology beyond that provided by undergraduate dental hygiene/assisting programs and have formal background in educational methods, testing and measurement, and evaluation.

## **X. Facilities**

Radiographic facilities should meet federal and state regulations. Processing facilities should produce high-quality, diagnostically valuable radiographs utilizing manual (optional) and automatic processing techniques. A quality assurance program should be in place to allow students to gain the necessary experience to be able to implement,

Radiographic facilities should be designed to optimize operator/faculty radiation protection; X-ray equipment should meet existing federal and state regulations. Digital radiography equipment should be made available where possible. The darkroom or scanning room should be of adequate size, efficiently designed to produce high-quality, diagnostically useful radiographs and use either manual or automatic film processing techniques. Assess and analyze radiographic quality. Students should have the opportunity to use digital radiographic equipment. NOTE: Students cannot be used as subjects to practice exposing radiographs.

## **XI. Occupational Hazards**

In all procedures and protocols, the principles of radiation hygiene should be followed to protect both the patient and the clinician. Monitoring procedures should be implemented to ensure radiation safety. A quality assurance



program should be in place for monitoring radiographic quality and levels of occupational exposures.

## XII. Educational Strategies

The following formats may be appropriate for use as educational strategies when teaching radiology: case studies, problem-based scenarios, web-based technologies, hands-on practice, demonstration, questioning/inquiry, clinical reasoning, interactive exercises, computer simulation and mini labs.

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2. American Academy of Oral and Maxillofacial Radiology. See: [www.aaomr.org](http://www.aaomr.org).
3. U.S. Food and Drug Administration (FDA). See: <http://www.fda.gov/Radiation-EmittingProducts/default.htm>.
4. American Dental Association (ADA). See: [www.ada.org/prof/resources/topics/radiography.asp](http://www.ada.org/prof/resources/topics/radiography.asp)

5. Dental radiography principles and techniques, At:  
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[http://www.ada.org/~media/ADA/Member%20Center/Files/Dental\\_Radiographic\\_Examinations\\_2012.ashx](http://www.ada.org/~media/ADA/Member%20Center/Files/Dental_Radiographic_Examinations_2012.ashx).

## **Radiation—Use Guidelines for Dental Education Facilities**

### **I. Introduction**

The risks of ionizing radiation to patients and operators associated with diagnostic radiography are not known. Estimates of risks are based on the biological effects seen at higher doses and in the laboratory. Using a variety of assumptions, extrapolated data and inferences about the hazards to humans exposed to x-rays have informed this discussion. The debate over the interpretation of low-LET dose and effect relationships will continue, but it is accepted that diagnostic levels of x-radiation have the potential of causing harmful effects. This concern alone demands that professional judgment when working with x-ray-generating and -processing equipment. Maintaining current information for sound decision-making regarding radiation will assure that each individual is thoroughly conversant about radiation hazards, safety practices and state and federal radiation rules and regulations.

The controversy in quantifying risks should not obscure the immediate and concrete benefits associated with appropriate dental care based on correct diagnoses established, in part, by accurate interpretations of radiographs of acceptable technical quality. Risks must be weighed against benefits.

These guidelines are recommended actions that can improve the risk–benefit ratio by maximizing the diagnostic yield from radiography and by minimizing exposure to unnecessary radiation. Dental education facilities must model the behaviors that are expected by their graduates.

### **II. Administration**

- A. Each dental education facility should develop a radiation use policy that complies with the Federal Radiation Control for Health and Safety Act of 1969, the Consumer Patient Radiation Health and Safety Act of 1981, state rules and regulations and dental practice acts.
- B. The director of the oral radiology program or another full-time faculty member in oral radiology should be appointed as the radiation protection supervisor for all diagnostic radiation sources within the educational facility, with full and complete authority and responsibility to establish, implement and monitor facility-wide guidelines and policies on radiographic practices. This appointment should be communicated to other academic departments or program chairs/directors by the chief administrator officer of the educational facility.
- C. The radiation protection supervisor should work in cooperation with established university or hospital-wide radiation standard or radiation

protection programs to coordinate, monitor and control the use of x-ray and other imaging equipment.

- D. Only dentists, dental hygienists, students and certified dental assistants (in radiology) may make patient exposures. A dentist should establish a preliminary diagnosis and prescribe the appropriate radiographic procedures.
- E. The radiation protection supervisor should conduct periodic continuing education programs for all staff operating radiographic equipment.
- F. Radiography should be confined to the oral radiology clinic whenever possible. Off-site training, student externships and private practice model or interdisciplinary clinics would be reasonable exceptions.
- G. When installing or remodeling radiographic facilities or purchasing new equipment, the approval of the radiation protection supervisor should be obtained prior to installation.
- H. The radiation protection supervisor should implement and monitor a facility-wide radiographic quality assurance program.

### **III. Criteria for Exposure**

- A. A dentist should prescribe all radiographs via writing and/or electron ordering with e-signatures confirmed.
- B. If prior radiographs are available, they should be evaluated before new radiographs are prescribed. Only those additional views needed for complete diagnosis and treatment planning should be exposed. This requirement does not preclude making a new complete intraoral survey if it is appropriate to the diagnosis.
- C. To maximize the benefits of the radiation exposure, the need for all radiographs should be determined by using the selection criteria described in the Guidelines for Prescribing Dental Radiographs that were established by the FDA and are recommended by the American Dental Association.
- D. The need for radiographs during treatment should be based on the individual patient's needs and the professional judgment of the dentist.
- E. Radiographs obtained for administrative purposes only, including those for insurance claims, board examinations or legal proceedings, should not be made. However, diagnostic radiographs may be used for administrative purposes.

- F. Technical proficiency in radiographic technique should be achieved on skulls or manikins before students are allowed to expose patients.
- G. Radiographs of patients should not be made merely for the purpose of training or demonstrations.
- H. Radiographs may be taken for research purposes with institutional review board approval.
- I. Each educational facility should develop a retake policy that includes limits on the number of retakes and the need for faculty supervision during retakes.

#### **IV. Quality Assurance**

- A. The facility should implement a radiographic image quality assurance program and keep records of its activities.
- B. One qualified individual should monitor the quality assurance program and be responsible for appropriate documentation, including logbooks.
- C. A logbook should be maintained for each x-ray-generating unit and include the following information:
  - 1. Make, model and date of purchase.
  - 2. Correct exposure factors (additionally, posted adjacent to exposure room) according to the film speed or digital system used.
  - 3. Description of the unit and evidence of its compliance with current recommendations from both federal and state regulatory agencies.
  - 4. Dates and descriptions of each repair, upgrade or relocation of the unit.
  - 5. Documentation of the dates and results of safety surveys.
  - 6. Evidence of periodic calibrations of x-ray tube output.
  - 7. Dates and actions taken to correct and maintain image quality.
  - 8. A description of the room housing the unit and evidence of the adequacy of barriers.
- D. To maintain performance standards, a trained radiation technician should inspect all x-ray equipment yearly or more frequently. These reports should be kept in a logbook for future reference.
- E. A logbook should be maintained for each x-ray processor and/or scanner and include the following information:
  - 1. Make, model and date of purchase.
  - 2. Correct film processing time and temperature.
  - 3. Description of daily solution evaluation and maintenance activities, including replenishing, solution changes and cleaning.

4. Dates and description of each repair, upgrade or relocation of the processor.
  5. Dates and actions taken to correct and maintain image quality.
  6. Reference films and/or charted densities taken from densitometry images.
  7. A description of the darkroom and evidence of its light-tight properties, darkroom illumination safety and film storage facilities.
  8. Appropriate procedures and settings are used to process digital images.
- F. A retake log should be maintained for each employee and student who regularly makes radiographs to identify trends in technical errors and the need for retraining.
- G. Policies should be posted in each satellite area.

#### **V. Dental/Dental Hygiene Board Examination Patient**

- A. The need for radiographs should be established by clinical indication and professional judgment and contribute to the proper diagnosis and treatment of the patient. Follow the Guidelines for Prescribing Dental Radiographs.
- B. Radiographs should not be made for testing purposes only.

#### **VI. Satellite Radiographic Facilities**

- A. The radiation protection supervisor should have the complete authority and responsibility for controlling use of ionizing radiation and assuring the use of good radiological practices in other clinical departments and programs.
- B. To assist the radiation protection supervisor, a satellite facilities committee should be formed by the administration. This committee of faculty should represent all departments and programs with radiographic capacity within the facilities, and its members should monitor their clinics' daily compliance with the facilities' radiation use policy.
- C. Quality assurance activities should be assigned to specific staff members. Actions taken to maintain quality and safety should be documented.
- D. The policy for the use of satellite x-ray facilities should be consistent with the facility's radiation use policy and these radiation use guidelines. The policy should be posted in each satellite area.

## **VII. Radiation Monitoring**

- A. Film badges or thermoluminescent personnel-monitoring devices should be worn during working hours by all faculty and staff who regularly use x-ray equipment.
- B. Each employee's dosimetry reports should be kept as permanent records and be available for inspection by the employee.
- C. These employees should not receive more than 50 mSv (5REM) each year, the radiation protection guide value.
- D. For added precautions, a quarterly reading above 10% of the radiation protection guide of 1.25 mSv (125 REM) should be investigated. Radiation workers should receive as little radiation as reasonably achievable (ALARA).
- E. Operators who are pregnant should not be exposed to more than 5 mSv (500 mREM) during the term of pregnancy.

## **VII. Records**

- A. Documentation of all radiographs and radiation exposures for each patient should be maintained in the patient's record. The record should include the number and type of radiographs (including radiographs remade), the date of exposure, the name of the operator and the name of the faculty member or dentist who requested the radiographs and retakes.
- B. All intraoral radiographs should be mounted and labeled with the patient's name and the date exposed. No loose, unmounted, intraoral radiographs should be stored in the patient's record. All extra oral and duplicate radiographs should be labeled with the patient's name, the date exposed and right/ left side orientation.
- C. Interpretation of radiographs should be documented in the patient's record.
- D. Radiographs should be stored in a manner that makes them readily available to all record users.

## **VIII. Infection Control for Digital Devices**

- A. The use of digital imaging in dentistry has continued to increase, bringing with it several advantages (e.g., lower absorbed dose, environmentally friendly, interoperability of images, image enhancement features, etc). Conversely, a major disadvantage of digital imaging is the inability to heat, sterilize or dispose of the receptor after use. This results in an

- increased opportunity for cross-contamination and disease transmission to occur. Thus, infection control in dental radiology must be addressed.
- B. Ideally, ethylene oxide gas is an excellent choice for sterilizing photostimulable phosphor (PSP) receptors after use. Unfortunately, this option is not always available for private dental offices and community clinics. Therefore, other choices may include use of a tuberculocidal, Environmental Protection Agency (EPA)-registered surface disinfectant wipe or liquid. Plastic barriers on receptors and equipment with a charge-coupled device (CCD) will help prevent perforations. As in any patient care environment, personnel protective equipment (PPE) should be used when exposing and processing radiographs.

#### **IX. Hand-held Radiographic Devices**

- A. A recent advancement in dental radiology is the use of hand-held x-ray unit devices in dental offices and community sites. As with the use of any type of ionizing radiation, it is imperative that both the operator and patient are kept in a safe environment while rendering quality radiographic images. The device should be positioned mid-body on the operator with the arm stabilized against the body. This will help minimize motion, which would create image distortion. It is recommended that the device be FDA-approved.



## **Ethics and Professionalism**

### **I. Introduction**

The allied dental health curriculum in ethics and professionalism prepares the student with knowledge, skills and values important to their interactions with student colleagues, faculty, allied health personnel and patients during their educational experiences. The foundation in ethics and professionalism is also integral to their experiences following graduation as licensed health care providers. The curriculum should provide a brief discussion of moral philosophy as an introduction to ethical principles and core values found in codes of ethics, and as a basis for critical thinking. In teaching ethics, a decision-making model that takes the students from recognizing an ethical dilemma to arriving at a possible solution that leads to an action should be adopted. Students should learn also how to evaluate and justify the selected action. While confronting opposing viewpoints or conflicting moral obligations, students should be taught to consider social norms, personal experience, socialization, cultural diversity, socioeconomic disparities and religious values.

The concepts of professionals, professionalism and professional responsibility should be articulated with the individual, other health professionals and the dental team perspective. Legal concepts and responsibilities should be integrated to provide guidance in verbal, written and electronic communication, decision-making and understanding scope of practice.

Case studies or scenarios that mimic real-life situations encountered in various practice settings (e.g., private practice, community, education, research, business, etc.) should be utilized. As professionals continue to become more accountable to the public, allied dental health practitioners will need to take more responsibility for their actions. Thus, it will be important for the curriculum to address issues regarding social responsibility and good citizenship. Legal issues sometimes merge with ethical determination of right and wrong. It will be necessary to integrate legal issues (e.g., Civil Rights Act, HIPAA, Americans with Disabilities Act, Patients' Bill of Rights, State Dental Practice Acts, etc.) with moral issues to resolve ethical problems. An understanding of legal issues also provides a framework for decision-making to avoid unprofessional behavior that may have legal consequences.

We are a changing society with constant influx of new ideas and information. To provide the patient with the highest standard of care attainable, the allied dental practitioner needs to keep abreast of the professional literature, paradigm shifts in treatment modalities, developing techniques and skill enhancement. The curriculum should instill the commitment for life-long learning and self-assessment. This is essential to promote professionalism.

## **II. Interrelationship**

Ethics is a thread throughout the allied dental health curriculum, throughout the practice of a profession and, indeed, throughout life. One of the attributes of a profession (or professional conduct) is a Code of Ethics. Students should be introduced to ethical concepts and behaviors at the start of their professional career, during orientation, to guide their interactions with student peers, faculty and staff. In dealing with patients, one implements many core values and ethical principles. From the first encounter with a patient, the student practitioner applies ethical concepts such as confidentiality, trust, fidelity, informed consent, autonomy and veracity. These values/principles should also guide behavior and decision-making outside clinical practice and into other practice arenas such as research, community, education and business. All those involved in the educational process—faculty, support staff and administrators—should model ethical behavior; off-campus sites should also emulate those behaviors and values fostered in the allied health ethics curriculum.

## **III. Overview**

A curriculum in ethics should focus on its relationship to professionalism in the allied dental professions. The curriculum should introduce the student to a wide range of ethical issues in allied dental health and dentistry. In addition to the presentation of concepts, the curriculum should provide an opportunity for the student to apply ethical principles and values to actual clinical cases and practice, using a case-oriented approach. The themes of professionalism, ethically based decision-making and professional responsibility should be incorporated in all aspects of the curriculum as an integral aspect of professional education and practice.

The students should be familiar with ethical codes impacting the allied dental professions, especially those pertinent to the professions for which they are seeking formal training. An ethics curriculum should provide a framework for ethical decision-making used throughout the educational experience and modeled by faculty. Allied dental providers are subject to disciplinary actions by state dental boards or may be subject to civil or criminal litigation during their professional careers. Students should be familiar with basic legal concepts related to patient care, including tort and contract law, scope of practice, record keeping and licensure requirements. In light of the rapid expansion of technology and social media, students should be aware of the ethical and legal ramifications of misusing something as simple as taking a photo on a cell phone or an overheard conversation.

The curriculum should address ethically based professional responsibilities, including awareness of legal principles guiding dental care delivery and the professional's obligation to lifelong learning and evidence-based decision-

making. Professional commitment to community service and social justice, supported by a background in cultural competence, must be incorporated into the curriculum as part of a professional's ethical responsibilities. Service-learning activities provide opportunities for students to reflect on ethical problems encountered during their experiences. Appreciation of other cultures leads to better understanding and treatment outcomes, not only in one's neighborhood but also of worldwide problems basic to quality of life.

Curriculum development should consider current ethical issues impacting dental care delivery, including but not limited to, roles and responsibilities of members of the dental team, patient rights, quality of care, state licensure, record keeping and record retention, employer and employee relationships, compromised practitioners and state and federal legislative mandates. As dental teams partner with other professionals in holistic and integrated health care, ethical behavior and mutual respect underlines the collaboration. Students should be aware of legislative efforts, such as lobbying, that will advance their chosen profession and increase access to care for their patients and the community in which they serve.

#### **IV. Primary Educational Goals**

A course in ethics should contribute to the development of individual students who are aware of and sensitized to ethical issues in the practice of dentistry. Acknowledging that a professional seeks to exhibit behaviors in the role of a clinician, change agent, educator, consumer advocate, researcher or administrator, educational experiences in an allied dental professions curriculum should further stimulate the moral obligation and personal responsibility to serve others, including patients and the community at large. Providing dental services, according to acceptable standards of care, should be reinforced across the curriculum with emphasis in both didactic and clinical courses.

#### **V. Prerequisites**

Students may be formally admitted to an allied dental education program with entry points ranging from high school to previously earned college degrees. A broad-based liberal arts preparation, including coursework in the sciences, humanities and communication, is desirable. Students should possess proficiency in written and oral expression, necessary for discussion of ethics-related content in the curriculum.

#### **VI. Core Content**

- A. Professionalism.
  - 1. History of the allied dental professions.
    - a. Relationship to dental professions.
    - b. Description of roles and responsibilities of each professional.

2. Current trends in the dental professions with emphasis on the particular allied area.
  3. Definition and characteristics of a profession.
  4. Mission and purpose of key allied and dental organizations, including those pertinent to a particular location. Examples include: ADHA, ADA, ADAA, National Dental Association/National Dental Hygiene Association (NDA/NDHA), ADEA, Hispanic Dental Association (HDA), Society for American Indian Dentists (SAID), Canadian Dental Hygiene Association (CDHA), Canadian Dental Association (CDA) and dental therapists.
  5. Codes of ethics.
    - a. Purpose of ethical codes.
    - b. Common themes in various codes.
    - c. Codes of ethics.
    - d. Review codes pertinent to discipline, location of program and student characteristics.
      - i. ADHA Code of Ethics.
      - ii. ADA Principles of Ethics and Code of Professional Conduct.
      - iii. ADAA Code of Ethics.
      - iv. Other codes for dental professionals.
    - e. Identification of common themes in codes reviewed.
  6. Individualized patient care.
    - a. Worldview unique to each individual.
    - b. Role of worldview from perspectives of both patient and professional.
    - c. Role of the dental hygienist in health care and the impact of respect.
    - d. Professional relationship between the health care provider and the patient, specifically in terms of competence, fairness, integrity, responsibility, respect and service-mindedness.
- B. Ethics.
1. Concepts and influences on orientation.
    - a. Morals.
    - b. Worldview.
    - c. Values.
    - c. Cultural/religious beliefs.
  2. Ethical theories.
    - a. Utilitarian.
    - b. Deontological.
    - c. Virtue.
  3. Ethical principles.
    - a. Autonomy.
    - b. Nonmaleficence.
    - c. Beneficence.

- d. Justice.
    - e. Social justice and distributive justice.
    - f. Others: veracity, confidentiality, societal trust, fidelity.
  - 4. Ethical dilemmas.
    - a. Defining ethical dilemmas.
    - b. Identifying examples of dilemmas that are most frequently encountered in the professional education setting and private practice.
    - c. Ethical decision-making framework.
      - i. Dilemma identification.
      - ii. Identification of ethically sound alternatives.
      - iii. Analysis and ranking of alternatives using ethical principles and code of ethics.
      - iv. Selection of choice to act upon.
    - d. Application of framework to commonly encountered dilemmas.
  - 5. Ethically based professional responsibilities.
    - a. Evidence-based practice and decision-making.
      - i. Research.
      - ii. Use of scientific literature and other research-based resources.
    - b. Community-centered obligations.
      - i. Social justice.
      - ii. Commitment to the common good.
      - iii. Volunteerism and advocacy initiatives.
      - iv. Global responsibilities.
    - c. Personal and professional social media use.
      - i. Confidentiality.
      - ii. Harassment or bullying.
      - iii. Illegal or fraudulent activity.
- C. Legal roles and responsibilities.
  - 1. Awareness of legal principles guiding health care delivery.
    - a. Criminal and civil law definitions.
    - b. Contractual obligations in patient care.
    - c. Actions to prevent allegations of professional malpractice specifically related to torts, e.g., negligence or lack of informed consent.
    - d. Documentation and record retention.
    - e. Reporting obligations, e.g., child and adult abuse.
    - f. Knowledge of federal and state laws.
      - i. HIPAA.
      - ii. OSHA.
      - iii. Patient Bill of Rights.
  - 2. Employer and employee protections.
    - a. Hiring, compensation and termination.
    - b. Civil rights protections: federal and state.

- c. Supervision, delegation and scope of practice.
  - d. Ethnic, religious and gender harassment protections.
- 3. State dental acts, public health codes and administrative laws.  
Relate the role of the state in governing of health care professions.
  - a. Identify the provisions likely to be included in state statutory law for the practice of allied health.
  - b. List the reasons that a license may be suspended, restricted or revoked.
  - c. Define and describe applicable supervision categories, e.g., direct supervision, indirect supervision and general supervision.
  - d. Recognize the responsibility of the dental professional to be knowledgeable regarding state statutory and regulatory provisions.
  - e. Scope of practice for members of dental team and interprofessional teams.
  - f. Relicensure obligations, including certifications, continuing education and reporting requirements.
- D. Cultural knowledge and sensitivity/cultural competence.
  - 1. Colleague interactions and expectations.
  - 2. Impact of cultural influences and worldview on patient interactions.

## **VII. Behavioral Objectives**

Upon completion of the curriculum in ethics, law and professionalism, students should demonstrate integration of all the different ethical and legal elements that apply to frequently encountered dilemmas.

- 1. Define the terms “ethics,” “morality” and “the law.”
- 2. Describe worldview and discuss how every individual’s worldview is unique.
- 3. Reflect on individual worldview and the role it plays in how other people and circumstances are interpreted.
- 4. Acknowledge that everyone has a view of the world based on a variety of experiences and sources and thus views the world differently, and that all worldviews embody some truths and have roots in reality.
- 5. Communicate one’s own worldview regarding basic questions that all worldviews answer.
- 6. Describe the role of the dental hygienist in health care and the impact that respect for people has on that role.
- 7. Explain the professional relationship between the health care provider and the patient, specifically in terms of competence, fairness, integrity, responsibility, respect and service-mindedness.
- 8. Distinguish between the theories of utilitarianism, deontology and virtue ethics.

9. Identify the core values found in the Codes of Ethics of the American Dental Hygienists' Association, American Dental Assistants' Association, International Federation of Dental Hygienists, National Association of Dental Laboratories and additional codes highlighted.
10. Define the terms autonomy, confidentiality, societal trust, nonmaleficence, beneficence, justice, social justice, veracity and fidelity.
11. Discuss the criteria for informed consent and informed refusal.
12. Describe the purpose and common elements in a patient bill of rights.
13. Describe what creates an ethical dilemma.
14. Describe an ethical decision-making framework that can be applied to an ethical dilemma.
15. Apply an ethical decision-making framework to a case-based situation and be able to defend the choice of action.
16. Compare the concepts of civil law with criminal law, using examples found in allied dental health practices.
17. List the types and circumstances of supervision (or absence of supervision) found in the Dental Practice Act.
18. Describe scope of practice for members of the dental team.
19. Define and distinguish common legal concepts/terms, including malpractice, torts, contracts, felony and fraud.
20. Discuss the rights of patients protected by law and duties of providers regulated by law from the ethical, legal and professional perspectives.
21. Discuss the ethical and legal obligations to identify and report the signs of abuse (child, spouse and elderly).
22. Discuss the concept of justice and apply the common good to the delivery of and access to dental services.
23. Describe federal and state laws that impact the delivery of care and surrounding ethical issues.
24. Describe federal and state laws that impact the employer–employee relationship.
25. Describe cultural sensitivity and cultural competence and provide examples pertinent to patient care delivery.
26. List the steps necessary to attain cultural competence.
27. Define health literacy and provide examples of assisting patients with health literacy challenges.
28. Discuss ethical and legal protocols to protect information in the age of computers, social media and other technical advances.
29. Review the changes in the practice of allied dental professions focusing on educational requirements and credentialing as a profession.
30. Identify frequently encountered ethical or illegal challenges in the delivery of dental care and resources to address the challenges identified.

## **VIII. Sequencing**

The role of ethics in professional development should be highlighted in materials describing the program and incorporated in the application process. Ethics should be a thread throughout the professional sequence initiated during the first semester and continuing through each semester. This should be part of the curriculum management plan as well as assessment criteria for allied dental education programs.

## **XI. Faculty**

Faculty responsible for courses in ethics should have formal education (ideally, formal courses in ethics at the post-secondary level), informal training (continuing education, workshops, seminars, etc.) and/or knowledge of the literature. Opportunities should be developed for collaboration with other faculty who teach ethics in the same institution, as well as with other dental and allied dental educators. Faculty should possess the skills to lead and facilitate open discussion, especially with unpopular viewpoints. Faculty members who are designated as responsible for teaching ethics should provide workshops or in-service activities for faculty members and staff to facilitate the integration of ethics and ethical decision-making across the curriculum.

## **XII. Facilities**

Space should be provided that allows for both large- and small-group discussion (movable furniture, chairs, etc.). The environment should lend itself to open and respectful discussion.

## **XIII. Teaching and Learning Strategies**

1. Create cases that include legal and ethical issues, including dental practice act issues.
2. Invite alumni to discuss frequently encountered dilemmas.
3. Assign groups randomly so that students do not participate with friends, allowing for students to experience different viewpoints.
4. Develop the "2-minute elevator ride" speech in terms of lobbying for a specific issue, e.g., access to care or scope of practice.
5. Evaluate decision-making for ethical dilemmas based on the process and not the decision made. This may mean a series of case scenarios with each new one added to the previous situation presented. Helpful for IPE classes by adding different nuances important to a particular discipline.
6. Compare state practice acts to identify common elements. Faculty can choose the specific items, such as continuing education requirements, procedures with/without supervision, etc.



7. Review protocol at your institution for grant applications and/or human subjects' approval (National Institutes of Health [NIH] has a helpful tutorial on its website that reviews protocol for ethics in research).
8. Participate/organize a town meeting or university/college-wide event focused on an issue of concern.
9. Develop a code of ethics for the class or for private practice.
10. Develop a class or institutional social media policy or a social media policy for private practice.

#### **XIV. Bibliography**

##### **Books**

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11. Thomas EM. Case studies in dental hygiene. 3<sup>rd</sup> ed. Upper Saddle River, NJ: Person Education, Inc., 2013.
12. Wilkins EM. Clinical practice of the dental hygienist. 11<sup>th</sup> ed. Philadelphia: Lippincott, Williams & Wilkins, 2013.

##### **Websites**

American College of Dentists

[www.acd.org](http://www.acd.org)

American Dental Association (ADA)

[www.ada.org](http://www.ada.org)

American Dental Assistants Association (ADAA)

[www.dentalassistant.org](http://www.dentalassistant.org)

American Dental Education Association (ADEA)

[www.adea.org](http://www.adea.org)

American Dental Hygienists' Association (ADHA)

[www.adha.org](http://www.adha.org)

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| Canadian Dental Association/L'Association<br>Dentaire Canadienne (CDA/ADC) | <a href="http://www.cda-adc.ca">www.cda-adc.ca</a>                               |
| American Society for Dental Ethics   | <a href="http://www.societyfordentaethics.org">www.societyfordentaethics.org</a> |
| Canadian Dental Assistants' Association (CDAA)                             | <a href="http://www.cdAA.ca">www.cdAA.ca</a>                                     |
| Canadian Dental Hygienists Association (CDHA)                              | <a href="http://www.cdha.ca">www.cdha.ca</a>                                     |
| International Association of Dental Research (IADR)                        | <a href="http://www.iadr.com">www.iadr.com</a>                                   |
| International Federation of Dental Hygienists                              | <a href="http://www.ifdh.org">www.ifdh.org</a>                                   |
| Journal of the American College of Dentists (JACD)                         | <a href="http://www.facd.org">www.facd.org</a>                                   |
| Hispanic Dental Association (HDA)  | <a href="http://www.hdassoc.org">www.hdassoc.org</a>                             |
| National Association of Dental Laboratories (NADL)                         | <a href="http://www.nadl.org">www.nadl.org</a>                                   |
| National Dental/National Dental Hygienists Association                     | <a href="http://ndaonline.org">http://ndaonline.org</a>                          |
| National Institutes of Health  | <a href="http://www.nih.gov">http://www.nih.gov</a>                              |

## DENTAL ASSISTING CURRICULUM GUIDELINES

### General and Oral Pathology for Dental Assisting

#### I. Introduction

Pathology describes the portion of the dental assisting curriculum that prepares students to understand, describe and identify disease. It includes the basic principles of disease and their application to specific organ systems. Special emphasis is given to those elements of pathophysiology and organ systems with which the student will assist in the performance of clinical functions and/or clerical services supportive in the diagnosis, prevention and treatment of oral diseases by the dentist.

#### Definitions

- A. **General pathology:** The branch of biologic science that includes the nature of disease, its causes, processes and effects with associated alterations of structure and function.
- B. **Oral pathology:** The branch of biologic science that includes the etiology, pathogenesis, identification and management of diseases that affect the oral and maxillofacial regions.
- C. **Diagnosis:** The identification of a specific disease. The diagnostic process includes: clinical identification, radiographic interpretation, historical data, laboratory studies, surgical intervention, therapeutic application and the differential diagnosis.

#### II. Interrelationships

Pathology integrates both basic and clinical sciences. An understanding of basic pathophysiology requires knowledge of normal anatomy and physiology, as well as embryology and histology related to the head and neck region. Pathology integrates basic science and applies the knowledge gained to the recognition and understanding of deviation from normal.

Understanding clinical manifestations and treatment of pathologies requires knowledge of the core clinical dental curriculum and the sciences, including collecting and interpreting data, and assistance with differential diagnoses to aid the dentist in diagnoses and treatment planning.

The design of the oral pathology curriculum for dental assisting students will vary in different academic settings and program levels. For example, dental assisting programs range from preparing students for entry-level chairside assisting to performance of delegated intraoral functions provided in direct

patient care, as delineated within the scope of the state practice acts. The components of oral and general pathology may be addressed in one core course or integrated into several courses throughout the curriculum. The depth and scope of the curriculum may vary with the program level and academic setting.

### **III. Overview**

Pathology in the dental assisting curriculum includes a basic understanding of general and oral pathology. General pathology should include an overview of basic disease processes, such as cellular adaptations, inflammation, immunology, allergy and wound healing and neoplasia. The oral pathology portion of the curriculum emphasizes recognition of deviations from normal oral tissues based on clinical signs and symptoms, as well as dental imaging.

### **IV. Primary Educational Goals**

At the completion of the pathology curriculum, the student will be able to demonstrate the knowledge of patient demographics, etiology, clinical conditions, appropriate imaging and differential diagnoses for diagnoses and treatment planning with suspected lesions/disease/conditions. The language of pathology and an understanding of the etiology, pathophysiology, and structural and functional alterations that result from the disease processes should be included in the curriculum.

Student assessment should require the student to demonstrate a working knowledge of oral pathology that is appropriate to the level of skills taught within the curriculum. To the extent possible, it is recommended that the instructional objectives involve the higher cognitive domains, including application to specific clinical problems and synthesis of new knowledge from basic principles. The curriculum should include instructional objectives that include higher cognitive domains, such as case studies.

### **V. Prerequisites**

Prerequisite courses should provide the students with a foundation in basic biomedical, dental and clinical sciences. These courses should provide content areas that will prepare the student for the study of pathology or be taught concurrently to ensure an understanding of the fundamental concepts of general and oral pathology. Content areas should include the following: oral/dental anatomy and physiology, head and neck anatomy, oral-facial histology and embryology, microbiology, immunology, radiology, nutrition, periodontics, oral surgery and systemic and oral disease transmission, as it relates to dental care and preclinical dental assisting courses.

Behavioral science content should be an integral component of the curriculum so that the student will be able to understand the legal and ethical role of the dental assistant, as well as the dynamics of the dentist–patient–dental assistant interaction in the discussion of findings.

## **VI. Core Curriculum Outline: General Pathology**

- A. Introduction.
  - 1. Definition of general and oral pathology.
  - 2. Dental team role in oral pathology procedures.
    - a. Legal and ethical aspects.
    - b. Clinical procedures.
    - c. Patient communication.
- B. Diagnostic process.
  - 1. Clinical.
  - 2. Radiographic.
  - 3. Historical.
  - 4. Laboratory.
  - 5. Microscopic.
  - 6. Surgical.
  - 7. Therapeutic.
  - 8. Differential diagnoses.
- C. Assisting with diagnostic procedures.
  - 1. Biopsy.
  - 2. Cytology.
  - 3. Laboratory tests.
  - 4. Referral to medical and dental specialists.
  - 5. Care, packaging and transport of specimens and samples.
  - 6. Record keeping.
- D. Concepts of immunology.
  - 1. Immunocompromised.
  - 2. Immunodeficiency.
  - 3. Hypersensitivity.
  - 4. Autoimmunity.
  - 5. Allergies.
- E. Regeneration and repair.
  - 1. Types of healing.
  - 2. Cellular biology.
  - 3. Factors that influence wound healing.
  - 4. Complications of wound healing.
- F. Types of tissue change.
  - 1. Inflammation.
  - 2. Trauma.
    - a. Physical
    - b. Chemical.
    - c. Thermal.

- d. Electrical.
    - e. Radiation.
  - 3. Increased growth.
    - a. Hyperplasia.
    - b. Hypertrophy.
    - c. Cyst.
    - d. Metaplasia.
    - e. Dysplasia.
  - 4. Decreased growth.
    - a. Hypoplasia.
    - b. Atrophy.
  - 5. Neoplasia.
    - a. Classification.
    - b. Nomenclature.
    - c. Clinical features.
- G. Infectious diseases.
  - 1. Bacterial.
  - 2. Viral.
  - 3. Fungal.
  - 4. Parasitic.

## VII. Core Curriculum Outline: Oral Pathology

- A. Developmental disturbances of oral and maxillofacial region.
  - 1. Fordyce granules.
  - 2. Melanin pigmentation.
  - 3. Palatal rugae.
  - 4. Torus palatinus.
  - 5. Mandibular tori.
  - 6. Exostoses.
  - 7. Retrocuspid papilla.
  - 8. Lingual tonsil.
  - 9. Lingual thyroid.
  - 10. Sublingual varicosities.
  - 11. Linea alba.
  - 12. Fissured tongue.
  - 13. Macroglossia/microglossia.
  - 14. Glossitis.
    - a. Median rhomboid.
    - b. Benign migratory.
  - 15. Ankyloglossia.
  - 16. Hairy tongue.
  - 17. Oral-facial clefts.
  - 18. Commissural lip pits.

- B. Abnormalities of teeth.
  - 1. Environmental alterations of teeth.
  - 2. Developmental alterations of teeth: number, size, shape, structure, color and eruption.
- C. Pulpal and periapical disease.
  - 1. Pulpitis.
  - 2. Periapical abscess.
  - 3. Periapical granuloma.
  - 4. Pulp polyp.
  - 5. Pulp calcification.
  - 6. Resorption.
  - 7. Cellulitis.
- D. Periodontal disease.
  - 1. Inflammatory.
    - a. Gingivitis.
    - b. Periodontitis.
  - 2. Noninflammatory.
    - a. Pregnancy gingivitis.
    - b. Desquamative.
- E. Soft tissue cysts and tumors.
  - 1. White lesions.
    - a. Nicotine stomatitis.
    - b. Leukoplakia.
    - c. Leukoedema.
    - d. Keratosis.
    - e. Aspirin burn.
    - f. Candidiasis.
    - g. White spongy nevus.
  - 2. Vesicular/ulcerative lesions
    - a. Aphthous ulcers.
    - b. Peradenitis mucosa necrotica recurrens (major apthae).
    - c. Primary herpetic gingivostomatitis.
    - d. Secondary herpes (herpes labialis).
    - e. Herpes zoster.
    - f. Herpangina.
    - g. Kaposi's sarcoma.
    - h. Dermatoid cyst.
- F. Malignant soft tissue lesions.
  - 1. Carcinoma in situ.
  - 2. Squamous cell carcinoma.
  - 3. Basal cell carcinoma.
  - 4. Malignant melanoma.
- G. Odontogenic cysts and tumors.
  - 1. Primordial.
  - 2. Dentigerous.

3. Radicular.
4. Residual.
5. Lateral periodontal.
6. Mucocele.
7. Ranula.
8. Ameloblastoma.
9. Cementoblastoma.
10. Odontoma.
- H. Benign soft tissue proliferations and neoplasia.
  1. Epithelial.
    - a. Papilloma.
    - b. Verruca vulgaris.
    - c. Inflammatory papillary hyperplasia.
    - d. Hypertrophy.
    - e. Metaplasia.
    - f. Dysplasia.
  2. Mesenchymal.
    - a. Fibroma.
    - b. Epulis fissuratum.
    - c. Hemangioma.
    - d. Neurofibroma.
    - e. Lipoma.
    - f. Lymphangioma.
    - g. Pyogenic granuloma.
    - h. Congenital epulis.
- I. Systemic diseases, conditions and oral manifestations.
  1. Tuberculosis.
  2. Sexually transmitted diseases.
  3. Lupus erythematosus.
  4. Lichen planus.
  5. Blood: anemias, leukemias, hemorrhagic disorders.
  6. Hepatitis.
  7. Mumps.
  8. Measles.
  9. Chickenpox.
  10. Cardiovascular.
  11. Nutritional.
- J. Facial pain and neuromuscular diseases.
  1. Bell's palsy.
  2. Trigeminal neuralgia.
  3. Burning mouth syndrome.
  4. Temporomandibular joint dysfunction.
  5. Osteoarthritis.
  6. Rheumatoid arthritis.
  7. Radiation or chemotherapy.



- K. Bone pathology.
  - 1. Osteogenesis imperfect.
  - 2. Cleidocranial dysplasia.
  - 3. Paget's disease of bone.
  - 4. Central giant cell granuloma.
  - 5. Fibrous dysplasia.
  - 6. Cemento-osseous dysplasia.
  - 7. Ossifying fibroma.
  - 8. Gardner syndrome.
  - 9. Mandibulofacial dysostosis.
  - 10. Cherubism.
- L. Dermatologic diseases.
  - 1. Ectodermal dysplasia.

### VIII. Behavioral Objectives of Pathology

Objectives should be written for each lecture and should include, but not be limited to, terminology definitions and the relevance of oral conditions to clinical situations. Individual dental assisting programs will formulate their own learning objectives. Examples of behavioral objectives appropriate for pathology include:

- A. Apply pathologic concepts and definitions in the pathologic process.
- B. List and define the eight diagnostic categories that contribute to the diagnostic process.
- C. Assist the dentist with procedures for the diagnosis and treatment of pathological conditions.
- D. Explain the process of inflammation, repair and wound healing.
- E. Define and contrast the terms "hyperplasia" and "hypertrophy."
- F. Define and contrast the terms "metaplasia," "dysplasia," "hypoplasia" and "atrophy."
- G. Distinguish between chronic and acute inflammation.
- H. Explain the role of inflammation in periodontal and pulpal disease.
- I. Describe and contrast the primary function of the immune response with the primary function of the inflammatory response.
- J. Identify the types of hypersensitivity reactions and provide an example of each.
- K. Distinguish between hereditary, developmental and infectious disease.
- L. Identify one example each of a bacterial, viral, fungal and parasitic infection.
- M. Define the terms "neoplasm" and "neoplasia."
- N. Distinguish between benign and malignant neoplasms.
- O. Provide examples that illustrate the nomenclature of benign and malignant tumors.

- P. Define the term “opportunistic infection” and give an example of a systemic opportunistic infection and one example of an oral opportunistic infection.
- Q. Using clinical photographs, identify oral lesions on the basis of their clinical appearance.
- R. Describe and compare the following dental abnormalities: attrition, abrasion and erosion.
- S. Define and differentiate between the following based on the clinical and radiographic characteristics of each: pulpitis, periapical abscess and periapical granuloma.
- T. Compare and contrast recurrent intraoral herpes simplex infection with recurrent aphthous stomatitis.
- U. Describe the differences between odontogenic and nonodontogenic cysts.
- V. Describe the oral manifestations of squamous cell carcinoma.
- W. Describe the clinical manifestations of each type of oral candidiasis.

## **IX. Sequencing**

The sequencing and presentation of general and oral pathology content will vary in different academic settings and program levels. One approach is to present the pathology content as a separate course after completion of or concurrent with prerequisite courses in anatomy, physiology, embryology, histology, radiology and clinical assisting. Another method is to integrate pathology into other courses. Regardless of the sequencing presentation, it is important that the student is able to integrate the legal and ethical standards of patient care prior to or concurrent with the instruction related to pathology.

## **X. Faculty**

General and oral pathology content should be presented by individuals with background sufficient to provide instruction at a level appropriate for the program.

## **XII. Facilities**

Physical facilities for teaching pathology should include adequate lecture facilities with audiovisual equipment. There should be an adequate number of clinical photos, histological slides, models and patient case studies to enhance the student’s understanding of the material.

### **XIII. Occupational Hazards**

Any use or handling of tissue specimens that may be included as part of course or clinical instruction related to oral pathology should follow recommended Centers for Disease Control and Prevention (CDC) and Occupational Safety and Health Administration (OSHA) guidelines.

### **XIV. Bibliography**

1. Commission on Dental Accreditation. Accreditation standards for dental assisting education programs. Chicago: American Dental Association, 2014.
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3. Neville BW, Damm DD, Allen CM, Chi AC. Oral and maxillofacial pathology. 4<sup>th</sup> ed. St. Louis: Elsevier, 2016.

#### **Publisher Websites**

- Elsevier Evolve (<https://evolve.elsevier.com>)
- LWW thePoint (<https://thepoint.lww.com/student>)

## **Preclinical and Chairside Dental Assisting**

### **I. Introduction**

The study of preclinical dental assisting provides the students with knowledge in four-handed dentistry, ergonomics for the dental team, illumination, oral evacuation, tissue retraction, armamentarium, infection control and operator maintenance for any given dental procedure. It is designed to help students prepare for the clinical setting and become part of a quality dental health care team.

The concept of preclinical dental assisting is complex, and there may be subject areas mentioned in this section of the compendium, but are covered in depth in other sections. This is most important to the topic of expanded functions. Since there is not a national format for dental assisting, each state varies in what it delegates to dental assistants as expanded functions. Please refer to your State Dental Practice Act to find if topics in this section may be expanded functions in your area. Topics may be mentioned to preclinical understanding in this area, but will be covered for clinical practice in the Expanded Functions component.

### **II. Interrelationship**

Preclinical science knowledge is fundamental to the study of dental assisting. This knowledge is integrated with dental materials, oral anatomy, infection control and medical/dental emergencies.

Subject matter presented in this curriculum may be subdivided and presented in other portions of the dental assisting curriculum. The curriculum design should be governed by the educational setting and integrated into the overall dental assisting program.

### **III. Overview**

A curriculum in preclinical dental assisting should include objectives in the cognitive, affective and psychomotor domains. The curriculum should include the theories and application of four-handed dentistry, ergonomics for the dental team and infection control in didactic, laboratory and clinical settings. A glossary of dental terminology should be provided to the students. Emphasis is placed on orientation to the profession, infection control techniques, instruments, related expanded functions and diagnostic, operative and specialty procedures. Upon completion, students should be able to demonstrate proficiency in clinical dental assisting procedures.

#### IV. Primary Educational Goal

Upon completion of this course, the student should be able to provide chairside assistance to dental operators in operative dental procedures. Given varied clinical situations, the student should be able to apply and adapt the principles of work standards, four-handed dentistry, ergonomics for the dental team and infection control techniques to clinical proficiency.

#### V. Prerequisites

To enroll in this course, the student must have full acceptance into a dental assisting program. There are no prerequisite courses for preclinical dental assisting because the course should be offered in the first semester/quarter of the dental assisting program curriculum.

#### VI. Core Content Outline

Major subject areas that may be offered are listed below. Subject sequencing should reflect the philosophy and goals of the program and individual institution. Essential and nonessential subjects have not been identified because the curriculum length and breadth is a function of the given institutional program. Content of this course should include all those competencies included in the Commission on Dental Accreditation's *Accreditation Standards for Dental Assisting Programs*.

- A. Infection and hazard control techniques.
- B. Describe dental health team members with regard to educational requirements, dental organizations and professional roles in the dental office.
- C. Discuss, identify, operate and maintain dental operatory equipment.
- D. Ergonomics for the dental team.
- E. Medical/dental histories and vital signs.
- F. Instruments, tray setups and transfer methods.
- G. Moisture control.
- H. Isolation methods.
- I. Chairside instrumentation for restorative procedures.
- J. Dental charting.
- K. Pain management.
- L. Principles of dental patient assessment and management.
- M. Ethics/professionalism.
- N. Assisting with the armamentarium, materials and procedures associated with operative dentistry and dental specialties.

## VII. Behavioral Objectives

Upon successful completion of lectures and reading assignments as well as passing laboratory process evaluations, the student should be able to:

- A. Infection and hazard control techniques.
  1. Microbiology and infection control.
    - a. Describe the early beginnings of microbiology as a science.
    - b. Describe the early procedures used to control microbes and prevent infectious diseases.
    - c. List beneficial activities of microbes.
  2. Characteristics of microorganisms.
    - a. Describe the general structure of bacteria, viruses and fungi.
    - b. Describe what bacteria need to grow and how to control their growth.
    - c. Describe how bacteria are cultured.
    - d. Describe how bacteria make acids from sugar.
    - e. Describe the life cycle of viruses.
    - f. Describe the most important fungus in dentistry.
  3. Development of infectious diseases.
    - a. List the steps in the development of an infectious disease.
    - b. Describe the various stages of an infectious disease and describe how each stage is involved in the spread of the disease to others.
    - c. Differentiate between direct, indirect, droplet and airborne spread of disease agents.
    - d. List the ways microbes can enter the body and describe how the route of entry may relate to disease development.
    - e. List diseases producing properties of microbes.
    - f. Differentiate between antigens and antibodies.
    - g. Define immunity and describe how it is involved in protecting against infectious diseases and how it can cause damage to the body.
  4. Emerging diseases.
    - a. Define an emerging disease.
    - b. List the six ways infectious diseases may emerge, and give an example of each.
    - c. List some infectious diseases that have appeared since 1970.
  5. Blood-borne diseases.
    - a. List the bloodborne pathogens that are important to the practice of dentistry.
    - b. Compare the five major types of viral hepatitis.
    - c. Describe the relative infectivity of bloodborne pathogens after an occupational exposure.

6. Infection control rationale and regulations.
  - a. Describe rationale for performing infection control procedures in a dental office.
  - b. Describe the pathways by which microbes may be spread in the dental office.
  - c. List which infection control procedures can be used to interfere with the different pathways of microbial spread in the dental office.
  - d. Describe the goal of infection control.
  - e. Describe the role played by governmental and professional organizations in dental infection control
7. Oral and respiratory diseases.
  - a. List infectious diseases that occur in the mouth.
  - b. List systemic diseases that may produce oral lesions.
  - c. List respiratory infectious diseases that may be spread in the dental office.
  - d. List all the known herpes viruses and the diseases they cause.
  - e. List waterborne disease agents that may be spread through contaminated water.
8. Immunizations.
  - a. Identify diseases of importance to dental practices for which there are vaccines.
  - b. Identify diseases of importance to dental practices for which there are no vaccines.
  - c. Discuss the CDC list of vaccine-preventable diseases for health care workers.
  - d. Describe the vaccination processes for tetanus, influenza and hepatitis B.
9. Surface and equipment asepsis.
  - a. Determine which operatory surface may be involved in the patient-to-patient spread of microbes.
  - b. Differentiate between clinical contact surfaces and housekeeping surfaces.
  - c. Describe how to place and remove surface covers properly.
  - d. List the types of surface disinfectants and describe their properties.
  - e. Differentiate among low, intermediate and high-level disinfectants, and give examples of when they should be used.
10. Dental unit water asepsis.
  - a. Define biofilm and describe how it forms inside dental unit water lines.
  - b. List the microbes that may be present in dental unit water.
  - c. Describe the concerns of having microbes present in dental unit water.
  - d. Describe the different approaches for reducing the microbial quantity in dental unit water.
  - e. Describe the procedures for monitoring the quality of dental unit water.
  - f. Describe what a “boil water” notice means.

11. Aseptic technique.
  - a. Describe how to limit the spread of disease agents from the hands to environmental surfaces.
  - b. Describe how to limit the spread of disease agents from dental aerosols and spatter.
  - c. Describe the proper use of disposable items.
  - d. Describe the importance of the high-volume evacuator in infection control.
  - e. Describe how to change a high-volume evacuator trap safely.
  - f. Describe the proper use of the saliva ejector.
  - g. Describe the use of pre-procedural mouth rinses.
12. Waste management.
  - a. Describe and differentiate the two basic types of waste generated in the dental office.
  - b. List the five types of regulated dental waste.
  - c. Identify the federal agencies that regulate dental waste.
  - d. Design an acceptable action plan for the management of regulated dental waste.
  - e. List the eight elements associated with the safer management of regulated dental waste.
13. Occupational Safety and Health Administration (OSHA).
  - a. Describe the mission statement of the OSHA.
  - b. List the seven reasons (purposes) why OSHA was formed.
  - c. List what person OSHA covers.
  - d. Define an OSHA standard.
  - e. Describe how standards are developed.
  - f. Discuss state OSHA plans.
  - g. List the three major points of the OSHA 2003–2008 Strategic Management Plan.
14. Management of the office safety program.
  - a. Describe the duties of an office safety coordinator.
  - b. Describe a mechanism to evaluate the office infection control program.
  - c. List the safety documents, policy statements and records needed by a dental office.
  - d. Design a program to evaluate infection control in the office.
  - e. Describe the general nature of a checklist that can be used to organize and assess infection control procedures in the office.
15. Managing chemicals safely in the office.
  - a. Develop a method to determine the hazard potential of chemicals.
  - b. Design and maintain a written hazard communication program.
  - c. Identify four ways that OSHA solves a problem.
  - d. Design and maintain a written chemical hygiene plan.



The student should be able to perform and complete the following infection control procedures:

1. Demonstrate recommended hand washing techniques.
2. Demonstrate the placement of personal protective equipment.
3. Practice disinfecting procedures as required.
4. Demonstrate the placement of surface barriers in the operatory.
5. Demonstrate self and assisted surgical gloving techniques.
6. Discard hazardous wastes using methods prescribed by OSHA.
7. Safely perform manual or ultrasonic cleaning of instrumentation.
8. Demonstrate effective disinfecting techniques on equipment and instruments.
9. Maintain accurate records when performing biological monitoring of the autoclave.
10. Prepare instruments for sterilization using the wrap or bag technique.
11. Demonstrate operation of sterilizing, disinfecting and cleaning equipment.
12. Design and maintain a written hazard program.
13. Define terms used in infection control.
14. Discuss the contents and legal implications of the OSHA Bloodborne Pathogens Standard.
15. Describe aseptic technique including operatory preparation, dental radiology procedure and office and lab procedure.
16. Discuss common infectious diseases, such as viral hepatitis, HIV and tuberculosis.

B. The dental health care team.

1. Discuss the concept of professionalism.
2. Demonstrate the characteristics of a professional dental assistant.
3. Identify the purpose of the Health Insurance Portability and Accountability Act of 1996 (HIPAA).
4. Demonstrate the personal qualities of a professional dental assistant.
5. Describe the role and purpose of the American Dental Assistants Association (ADAA).
6. Describe the benefits of membership in the ADAA.
7. Describe the role of the Dental Assisting National Board (DANB).
8. Explain where to obtain information about the DANB.
9. Name the members of the dental health care team and describe their roles.
10. Name and describe each of the recognized dental specialties.
11. Describe the various roles and responsibilities of a dental assistant.
12. Identify the minimal educational requirements for each member of the dental health care team.
13. Describe the supportive services provided by other members of the dental health care team.

C. Equipment function and maintenance.

1. Discuss the functions, operation and maintenance of clinical equipment, including operation for patient seating and dismissal.
2. Demonstrate knowledge of operation of clinical equipment.
3. Describe the six areas of the dental environment in a professional office.
4. Discuss the important qualities of the reception area.
5. Describe the goals in designing the dental treatment area.
6. List the clinical equipment most commonly found in dental treatment areas.
7. Pronounce, define and spell key terms.
8. Discuss the historical importance of the dental handpiece.
9. Describe the low-speed handpiece and its use in dentistry.
10. Describe the attachments used on the low-speed handpiece.
11. Describe the high-speed handpiece and its uses.
12. Review other handpieces used in dentistry.
13. Identify dental handpieces and correctly attach them to the dental unit.

D. Ergonomics for the dental team.

1. Conform to the zones of activity as dictated by the operator.
2. Demonstrate ergonomic positioning of the dental team.
3. Demonstrate the appropriate procedure for seating and dismissing the patient. This includes special needs patients.
4. Transfer instrumentation using ergonomic concepts.
5. Position the dental lamp for maximum oral illumination.
6. Ergonomically place and position the high velocity evacuation tip and saliva ejector to maintain a dry field.
7. Describe the goals of ergonomics.
8. Demonstrate the exercises that can reduce muscle fatigue and strengthen muscles.
9. Demonstrate the neutral working position.
10. Demonstrate exercises to reduce eyestrain.
11. Demonstrate exercises to reduce neck strain.
12. Identify common symptoms of musculoskeletal disorders.
13. Identify three categories of risk factors that contribute to increased risk for injury.
14. Describe the symptoms of carpal tunnel syndrome.

E. Medical and dental histories.

1. Identify the purpose of a patient record.
2. Describe each form in the patient record.
3. Supervise the completion of a new patient registration form.
4. Complete and review a patient medical and dental history.
5. Describe the relevance of a medical/dental history to dental treatment.
6. Assist in intraoral and extraoral examinations.
7. Identify the purpose of a patient record.
8. Describe each form in the patient record.

9. Supervise the completion of a new patient registration form.
  10. Record dental charting as dictated by the operator.
  11. Identify chronic health factors that affect dental treatment.
- F. Instruments, tray setups and transfer methods.
1. Describe the three parts of a dental hand instrument.
  2. Describe the instrument formula designed by G.V. Black.
  3. Discuss the theory of placing an instrument in a specific sequence.
  4. List the examination instruments and their uses.
  5. Identify examination instruments.
  6. List the types of hand (manual) cutting instruments and their uses.
  7. Identify hand (manual) cutting instruments.
  8. Select the appropriate instruments for a tray setup, given the procedure(s) to be performed.
  9. Prepare a tray setup, given the procedure(s) to be performed.
  10. Explain and demonstrate the instrument grasps required for assorted instruments.
  11. Transfer mixed materials and miscellaneous items using four- or six-handed dentistry.
- G. Oral illumination.
1. Position the dental light to illuminate the oral cavity during all chairside procedures.
- H. Moisture control.
1. List isolation techniques used to decrease moisture during a dental procedure.
  2. Describe the two types of oral evacuation systems used in dentistry.
  3. Describe the grasp and positioning of the high-volume evacuator tip.
  4. Perform the grasp and positioning of the high-volume evacuator during a procedure.
  5. Discuss the use of the air-water syringe.
  6. Perform limited-area and full-mouth rinses.
  7. Place cotton rolls for isolation.
  8. Maintain a dry field for the operator by positioning the high velocity suction and or saliva ejector.
  9. Explain the purpose of the dental dam and cotton roll isolation.
  10. List and explain the advantages and disadvantages of the dental dam and cotton roll isolation.
  11. Identify and assemble the armamentarium for placement of the dental dam.
  12. Demonstrate placement and removal of the dental dam and cotton rolls.
- I. Chairside instrumentation for restorative procedures.
1. Identify the three parts of a dental hand instrument.
  2. List and identify the types of hand cutting instruments and their uses.
  3. List and identify miscellaneous instrumentation and sundries used with common restorative procedures.

4. Identify any given bur by name, number and function.
5. List and identify the functions of abrasion rotary instruments.
6. Describe the purpose of preset trays and tubs in dentistry.
7. Anticipate the needs of the patient and operator during a procedure.
8. Describe the process and principles of cavity preparation.
9. Discuss the differences in assisting with an amalgam versus assisting with a composite restoration.
10. Prepare the setup and assist in a Class I restoration.
11. Prepare the setup and assist in a Class II restoration.
12. Prepare the setup and assist in a Class III restoration.
13. Prepare the setup and assist in a Class IV restoration.
14. Prepare the setup and assist in a Class V restoration.

J. Dental charting.

1. Define G.V. Black's cavity classifications.
2. Explain the differences between primary, mixed and permanent dentitions.
3. Explain how the size and shape of teeth determine the functions of different types of teeth.
4. Name and identify the location of each tooth surface.
5. Use terminology to identify landmarks of the teeth.
6. Identify and chart oral conditions using the Universal, Federation Dentaire Internationale and Palmer numbering systems.
7. List common abbreviations used to identify simple, compound and complex cavities.
8. Identify basic dental charting terminology.
9. Differentiate between an anatomic and a geometric diagram for charting.
10. Chart the correct restorative material for either an existing restoration or a required treatment.
11. Chart the correct symbol for either an existing restoration or a required treatment.
12. Explain the color coding of a chart diagram.

K. Pain Management

1. Describe the methods used to manage the pain and anxiety related to dental procedures.
2. Explain different topical anesthetics and demonstrate their placement.
3. Describe the types of local anesthetic and their indications and contraindications.
4. Explain and demonstrate the assembly of an anesthetic syringe.
5. Assemble the equipment and materials needed for an anesthetic tray setup.
6. Identify injection sites for the maxillary and mandibular arches and explain which teeth are involved.

7. Identify supplemental techniques to administer anesthetics.
8. Demonstrate placement of topical anesthetic.
9. Assist with and monitor the administration of nitrous oxide.
10. Identify and treat post-injection reactions.
11. Assist with and/or apply topical anesthetic.

L. Patient management/care.

1. Prepare the dental operatory for patient seating and dismissal.
2. Provide oral health instruction when indicated.
3. Provide postoperative or surgical instructions under the direction of the dentist.
4. Assist with and/or place fluoride when indicated and directed.
5. Maintain accurate patient treatment records.
6. Assist in medical/dental emergencies when necessary.
7. Describe the type of dental management a medically compromised patient would receive.
8. Describe the stages of aging in the older population.
9. Describe the orally related conditions affecting the older patient.
10. Describe the importance of the medical history for the medically compromised patient.
11. Describe the major medical disorders that can affect a patient's oral health.

M. Ethics and professionalism.

1. Ethics.
  - a. Explain the difference between ethical and legal situations.
  - b. Explain the purpose of a code of ethics.
  - c. Discuss the American Dental Assistants' Association Principles of Ethics.
  - d. Understand the Dental Assistant's responsibilities to the dentist, patient and other dental team members.
  - e. Explain and give examples of the basic principles of ethics.
  - f. Give examples of ethical dilemmas for each principle of ethics.
  - g. Develop case studies involving ethical dilemmas.
  - h. Describe the steps in ethical decision-making.

N. Dentistry and the law.

1. Describe the differences between civil and criminal law.
2. Explain the purpose of the state dental practice act.
3. Explain the purpose for licensing dental health professionals.
4. Give an example of a respondeat superior.
5. Describe the types of dental auxiliary supervision.
6. Explain the circumstances required for patient abandonment.
7. Describe ways to prevent malpractice suits.

Assisting with the armamentarium, materials and procedures associated with operative and dental specialties.

A. Restorative and esthetic dental materials.

1. Discuss how a dental material is evaluated before it is marketed to the profession.
2. List the properties of dental materials and ways they affect their application.
3. Discuss the differences between direct and indirect restorative materials.
4. Fabricate trays for bleaching, mouthguards and custom trays.

B. General dentistry.

1. Describe the process and principles of cavity preparation.
2. Discuss the differences in assisting with an amalgam versus assisting with a composite restoration.
3. Prepare the setup and assist in a Class I restoration.
4. Prepare the setup and assist in a Class II restoration.
5. Prepare the setup and assist in a Class III restoration.
6. Prepare the setup and assist in a Class IV restoration.
7. Prepare the setup and assist in a Class V restoration.

C. Matrix systems for restorative dentistry.

1. Describe the use of a matrix system in Class II, III and IV restorations.
2. Describe the type of matrices used for posterior restorations.
3. Assemble a universal retainer and matrix band.
4. Describe the purpose and use of a wedge.
5. Place and remove a matrix band and wedge for a Class II restoration.
6. Describe the type of matrices used for anterior restorations.
7. Place and remove a matrix and wedge for a Class III restoration.
8. Discuss alternative methods of matrix systems used in restorative dentistry.
9. Assist with and/or apply bases, liners and bonding agents.
10. Assist with and/or remove excess cement or bonding agents.

D. Fixed prosthodontics

1. List indications and contraindications for a fixed prosthesis.
2. Identify the steps for a diagnostic workup and/or preliminary impressions.
3. Describe the differences among full crowns, inlays, onlays and veneer crowns.
4. Describe the uses of porcelain for fixed prosthodontics.
5. Identify the components of a fixed bridge.

E. Provisional coverage.

1. Discuss indication for provisional coverage for a crown or fixed-bridge preparation.
2. Discuss the types of provisional coverage.

3. Discuss the dental assistant's role in making a provisional crown or bridge.
  4. Identify home care instructions for provisional coverage.
- F. Removable prosthodontics.
1. Differentiate between a partial and a full denture.
  2. Identify indications and contraindications for removable partial and full dentures.
  3. List the components of a partial denture.
  4. Describe the steps in the construction of a removable partial denture.
  5. Identify home care instructions for removable partial and full dentures.
- G. Dental implants.
1. Differentiate between a partial and a full denture.
  2. Identify indications and contraindications for removable partial and full dentures.
  3. List the components of a partial denture.
  4. Describe the steps in the construction of a removable partial denture.
  5. Identify home care instructions for removable partial and full dentures.
- H. Endodontics.
1. Describe the diagnostic testing performed for endodontic diagnosis.
  2. List the conclusions of the subjective and objective tests in the endodontic diagnosis.
  3. Assist in the electric pulp vitality test.
  4. Describe diagnostic conclusions for endodontic therapy.
- I. Periodontics.
1. Describe the role of the dental assistant in a periodontal practice.
  2. Explain the procedures necessary for a comprehensive periodontal examination.
  3. Demonstrate periodontal charting.
  4. Describe the role of radiographs in periodontal treatment.
  5. Identify and describe the instruments used in periodontal therapy.
  6. Describe the indications and contraindications for the use of the ultrasonic scaler.
- J. Oral and maxillofacial surgery.
1. Describe the specialty of oral and maxillofacial surgery.
  2. Discuss the role of the oral surgery assistant.
  3. Identify specialized instruments used for basic surgical procedures.
  4. Discuss the importance of the chain of asepsis during a surgical procedure.
  5. Prepare a sterile field.
  6. Perform a surgical scrub.
  7. Perform sterile gloving.
- K. Pediatric dentistry.
1. Describe the appearance and setting of a pediatric dental office.
  2. Give the stages of childhood from birth to adolescence.

3. Discuss the specific behavior techniques that work as positive reinforcement when treating children.
4. Describe why children and adults with special needs are treated in a pediatric office.

**L. Orthodontics.**

1. Describe the environment of an orthodontic practice.
2. Describe the types of malocclusion.
3. Discuss corrective orthodontics and describe what type of treatment is involved.
4. List the types of diagnostic records used to assess orthodontic problems.

**VIII. Sequencing**

Preclinical dental assisting is a fundamental course in dental assisting education. Therefore, it should be presented early in the curriculum. It is preferable that dental assisting students be concurrently enrolled in oral anatomy, infection control and introduction to dentistry during the presentation of the preclinical skills course. These courses should provide a foundation for skills application.

**IX. Faculty**

Faculty responsible for courses that cover preclinical and clinical assisting skills must have a formal course within education methodology and experience as a clinician in all related areas. Additionally, the faculty must be appropriately licensed or credentialed appropriate to the state dental practice act in which the curriculum is offered. Faculty must possess the skill to develop courses and learning experiences leading to competency in the content areas identified. Faculty should also possess or be in process of completing a minimum level of a baccalaureate degree.

**X. Facilities**

The appropriate classroom, laboratory and clinical facilities must be available in order to accommodate the number of enrolled students with regard to available faculty and resources. Recommended faculty to student ratios must be observed to ensure appropriate instruction and skill development.

1. Occupational hazards.

Special care must be taken to provide a safe environment for individuals using or coming into contact with specific dental materials and equipment. Limitations exist within the practice setting that prevent the development of a complete listing of all potential occupational hazards and safety precautions. Manufacturers supply additional information on specific materials and equipment.



In addition, the Standard for Occupational Exposure to Bloodborne Pathogens by the OSHA is recommended in all laboratory and clinical areas. This includes the guidelines of standard precautions, safe handling of supplies and materials, elimination and/or reduction of physical hazards and chemicals and an established plan for emergencies.

## **XI. Teaching and Learning Strategies**

- A. Create cases that include a variety of dental treatments to develop critical thinking skills.
- B. Invite alumni to discuss frequently encountered dilemmas.
- C. Assign groups randomly so that students do not group only with friends, allowing students to experience different viewpoints.
- D. Compare state practice acts to identify common elements. Faculty can choose the specific items, such as continuing education requirements, procedures with/without supervision, etc.
- E. Create a collaboration among other health departments to create scenarios for students from participating programs to work with each other for patient management. This could include dental hygiene, dental schools, emergency medical services (EMS), nursing etc. Students will learn to work as part of a team to get the patient to a state of health.
- F. Participate/organize a town meeting or university/college-wide event focused on an issue of concern.
- G. Compare practice acts to identify common elements.
- H. Participate in continuing education.
- I. Participate in interdepartmental team building and training.
- J. Organize and participate in community meetings and training on topics of concern.
- K. Be proficient in four-handed dentistry (didactic and clinical) and have a minimum of a bachelor's degree.
- L. Attend annual training on infection control to maintain current standards.

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## **Expanded Function Duties and Dental Materials for Dental Assisting**

### **I. Introduction**

The dental assisting curriculum in expanded functions and dental materials prepares the student with the knowledge and skills critical to performing related activities in the dental setting. A foundation in these areas is integral to performing needed functions as a credentialed dental assisting provider. The curriculum must include an overview of legally delegable functions and individual differences among state boards of dentistry and the need to access current information regarding state acts and best dental practice to assure compliance with local policy. A generic list of accepted functions and related materials should be included in order to ensure a thorough study of these two critical areas as part of a required skill set for dental assistants to enter the clinical practice setting.

States vary in what they classify as expanded functions for dental assistants. Please consult your state dental practice act to find out what functions are permitted for dental assistants in your area. If the duty is not listed in the expanded function section below, please consult the clinical assisting portion of this compendium.

The terms “expanded functions” and “expanded duties” are synonymous with each other, depending on the state in which you practice. In this document we have elected to use the term “expanded functions” to encompass both terms.

### **II. Interrelationship**

The expanded functions and dental materials components of the dental assisting curriculum are interrelated with the dental science, clinical and ethics and jurisprudence segments of the recommended dental assisting curriculum. The scope of practice varies considerably by state and region. The integration of ethical and core values are critical to guiding decision-making in clinical practice for compliance with stated regulations when performing expanded functions. Background knowledge in physical and chemical properties of various dental materials used in all phases of clinical practice is needed to ensure patients’ safety and best practices while performing expanded functions as part of direct patient care services. The armamentarium, procedure and dental materials used in performing advanced intraoral procedures are essential for the dental assistant as part of preparation to become a valuable member of the dental health care team.

### **III. Overview**

The curriculum should focus on basic concepts of clinical expanded functions and background knowledge in and appropriate manipulation of commonly used dental materials. Didactic information must be incorporated into the curriculum, in addition to significant laboratory and clinical experiences to ensure competency in performing the preparation of dental materials as part of clinical care and expanded functions performed by dental assistants.

### **IV. Primary Education Goals**

Courses in dental materials and expanded functions are integral to the development of students who need to be aware of state law and scope of practice. The scope of practice addresses not only the handling and manipulation of dental materials but also the reasons specific materials are selected for demonstrated competency in the performance of expanded functions by dental assistants.

In states where graduates of a program accredited by the Commission on Dental Accreditation (CODA) are authorized to perform additional functions defined by the program's state-specific dental board or regulatory agency, program curriculum must include content at the level, depth and scope required by that state. Further, curriculum content must include didactic and laboratory/preclinical objectives for the additional dental assisting skills and functions. Students must demonstrate laboratory/preclinical competence in performing these skills in the program facility prior to clinical practice.

Upon completion of the expanded functions and dental materials curriculum, the student will be able to:

- A. Apply principles of professional and ethical behavior when providing additional dental assisting services.
- B. Describe differences in race and culture in the classroom, laboratory and clinical setting with patients, classmates and faculty.
- C. Educate the patient about dental procedures, including dental materials and the proper maintenance of restorations and oral prostheses.
- D. Provide a variety of high-quality therapeutic and preventive services within the dental assisting scope of clinical practice, including selection and manipulation of appropriate dental materials.
- E. Make appropriate clinical judgments in the selection and use of dental materials and their subsequent reactions in the oral environment.

Mastery of the following cognitive areas and psychomotor skills should lead to course competence in expanded functions and dental materials:

- A. Understanding physical, chemical and biologic properties of specific dental materials.
- B. Relating these properties to the selection, manipulation and care of dental materials used within the dental assisting scope of practice.
- C. Recognizing, selecting and applying dental materials used in preventive, therapeutic and specialty dental procedures to provide quality patient care.
- D. Demonstrating current, acceptable aseptic and safety procedures in both laboratory and clinical settings when using a given material or providing therapeutic, specialty or preventive services.

## **V. Prerequisites**

Students may be formally admitted to dental assisting programs with various points of entry. Individuals may enter programs that are based in a high school, vocational technical school, community college, college, university or proprietary setting. There is little requirement in most states for mandatory education and credentialing of dental assistants. There are no uniform required standards across programs. However, many states in which expanded functions are permitted require varying degrees of preparation and demonstrated competency prior to issuing expanded functions permits or licenses. Per the American Dental Association (ADA) CODA accreditation standards for dental assisting programs, students are required to complete coursework in dental materials, expanded functions and ethics and jurisprudence. Accreditation standards further indicate that programs are offered at the post-secondary level. Therefore, individuals entering a CODA-accredited dental assisting program may be required to complete specific general education and prerequisite coursework prior to admission or concurrently with dental coursework as part of a curriculum. Prerequisite and corequisite coursework in general education and sciences is determined by the individual institution in compliance with related content areas as specified in the standards.

## **VI. Core Content**

**Dental Materials:** Definition of the discipline – Biomaterials is the science and technology of materials used in dentistry; it is the dental application of principles from the parent field of materials science and may also be called dental materials and other synonyms. The range of biomaterials applications includes all restorative materials in all dental specialties, laboratory technique materials, dental instruments and dental devices related to the use of materials.

**Expanded Functions:** Definition of the discipline – Expanded functions is an overview of legally delegable functions within the individual state parameters for a dental assistant to perform. A generic list of accepted functions and related materials should be included in order to ensure a thorough study of these two critical areas as part of a required skill set for dental assistants to enter the clinical practice setting.

- A. Basic core content: didactic.
  - 1. Introduction to dental materials.
    - a. Rationale for study.
    - b. Materials and the oral environment.
    - c. Historical aspects.
    - d. Standards for dental materials.
    - e. Classification of materials.
  - 2. Materials science.
    - a. Materials science (definitions).
    - b. Atomic bonding.
    - c. Materials and their atomic bonding.
  - 3. Physical and mechanical properties of dental materials.
    - a. Properties of materials defined (density, vapor pressure, thermal conductivity, etc.).
    - b. Mechanical properties (elasticity, stress, strain, etc.).
  - 4. Adhesive materials.
    - a. Adhesive materials in dentistry.
      - (1) Adhesion/bonding.
      - (2) Development.
      - (3) Surface factors.
    - b. Acid etching.
    - c. Dentinal bonding.
    - d. Glass ionomers.
  - 5. Direct polymeric restorative materials.
    - a. Acrylic resins.
      - (1) Steps in addition polymerization.
      - (2) Activation “options” of addition polymerization.
    - b. Problems with unfilled resins.
    - c. Improvements to dental resins.
    - d. Composite materials.
      - (1) Components of composites.
      - (2) Polymerization systems.
      - (3) Types and properties of dental composites.
      - (4) Uses.
      - (5) Factors affecting use.
      - (6) Placement.
    - e. Pit and fissure sealants.
    - f. Preventive resin restorations.

- g. Composite cements.
- h. Glass ionomer materials.
- i. Compomers.
- 6. Amalgam and direct metallic restorative materials.
  - a. Amalgam defined.
  - b. Advantages of using amalgam.
  - c. History of amalgam.
  - d. Low copper dental amalgam.
  - e. High copper dental amalgam.
  - f. Factors affecting handling and performance.
  - g. Amalgam properties (strength, creep corrosion, etc.).
  - h. Use of dental amalgam.
    - (1) Placement.
    - (2) Effect of moisture.
    - (3) Finishing and polishing.
    - (4) Mercury toxicity.
  - i. Direct gold restorations (gold foil).
- 7. Dental cements.
  - a. Uses.
    - (1) Luting agents.
    - (2) Pulp protection.
    - (3) Temporary restoration.
    - (4) Cavity sealers.
  - b. Chemistry.
  - c. Powders used in dental cements.
  - d. Liquids used in dental cements.
  - e. Powder/liquid ratios and systems of dental cements.
  - f. Zinc oxide-eugenol (ZOE) cement.
  - g. Zinc phosphate cement.
  - h. Glass ionomer cement.
  - i. Polycarboxylate cement.
  - j. Composite cement.
  - k. Other cements and uses.
- 8. Impression materials (available systems, trays, cost, etc.).
  - a. Classification.
  - b. ZOE impression material.
  - c. Hydrocolloid impression material.
    - (1) Irreversible.
    - (2) Reversible.
  - d. Elastomeric impression materials.
  - e. Digital impressions.

9. Gypsum materials.
  - a. Properties.
  - b. Types.
    - (1) Plaster.
    - (2) Stone.
    - (3) Improved stone.
  - c. Setting reaction.
  - d. Water/powder ratio.
  - e. Setting time.
  - f. Properties.
  - g. Technique of use.
10. Materials for fixed indirect restorations/prostheses.
  - a. Types.
  - b. Classification by tooth structure restored.
  - c. Classification by material.
  - d. Procedures for constructing an indirect restoration.
  - e. Alloys for all-metal cast restorations.
  - f. Alloys for ceramometal restorations.
  - g. All-ceramic restorative materials.
  - h. Composite indirect materials.
  - i. Advantages/Advantage of all-metal/ceramometal/ceramic restorations.
11. Removable prostheses and acrylic resins.
  - a. Acrylic resin defined.
  - b. Types (forms) of acrylic resin.
  - c. Complete dentures.
  - d. Construction of a complete denture.
  - e. Partial dentures.
  - f. Relining a denture.
  - g. Immediate dentures.
  - h. Repairing acrylic prostheses/appliances.
12. Radiographic appearance of dental materials.
  - a. Rationale for a. Radiology and dental materials, categorized by radiographic appearance and descriptions of dental materials.
13. Polishing materials and abrasion.
  - a. Definitions.
  - b. Types of abrasives.
  - c. Bonded and coated abrasives.
  - d. Factors affecting the rate of abrasion.
  - e. Polishing of coronal surfaces of teeth.
  - f. Polishing process.
    - (1) Reasons to polish.
    - (2) Selective polishing.



14. Tooth whitening.
  - a. Treatment options.
  - b. Causes of tooth discoloration.
  - c. Whitening agents.
  - d. Whitening techniques.
  - e. Side effects of whitening.
15. Oral appliances.
  - a. Types.
  - b. Material used in fabrication.
  - c. Fabrication of an oral appliance.
  - d. Maintenance of oral appliances.
16. Instruments as dental materials.
  - a. Composition of instruments.
  - b. Problems of instruments.
  - c. Instrument inspection.
  - d. Sharpening instruments.
    - (1) Why sharpen?
    - (2) Frequency.
17. Infection control and safety.
  - a. Disinfection of impressions.
  - b. Disinfecting dentures and other appliances.
  - c. Infection control protocol for laboratory procedures.
  - d. Physical hazards (lathes, model trimmers, respiratory, etc.).
  - d. Chemicals.
  - e. Safety Data Sheets (SDS).
- B. Core content: laboratory/clinical practice.
  18. Impressions for study casts.
    - a. Armamentarium.
    - b. Preparation of tray and material.
    - c. Placement and removal of tray.
    - d. Storage.
  19. Temporary restorations.
    - a. Types.
    - b. Purpose.
    - c. Armamentarium.
    - d. Preparation of material.
    - e. Placement and removal.
  20. Fabrication and trimming study models.
    - a. Construction of a study model.
    - b. Trimming casts or study models.
  21. Pit and fissure sealants.
    - a. Purpose and indications.
    - b. Contraindications.
    - c. Procedure.
    - d. Post-sealant evaluation.

22. Whitening tray fabrication/mouth protectors.
  - a. Purpose and indications.
  - b. Contraindications.
  - c. Procedure.

**OPTIONAL:** Additional content section.

- A. Didactic content.
  1. Wax and impression compound.
  2. Bite registration materials.
  3. Computer-aided design and manufacturing (CAD/CAM).
  4. Lost wax casting process.
    - a. Waxing.
    - b. Investing.
    - c. Burn-out.
  5. Dental implants as a dental material.
  6. Specialty materials.
    - a. Orthodontics.
    - b. Endodontics.
    - c. Periodontics.
    - d. Pediatric dentistry.
- B. Laboratory/clinical practice.
  1. Amalgam restorations.
    - a. Classification of caries.
    - b. Armamentarium.
    - c. Preparation/isolation.
    - d. Condensing amalgam.
    - e. Carving techniques.
    - f. Finishing and polishing amalgam.
    - g. Removing overhanging restorations.
  2. Tooth-colored restorations.
    - a. Armamentarium.
    - b. Acid-etch and bonding techniques.
    - c. Preparation and placement of restorative materials.
    - d. Finishing restoration.
  3. Custom impression tray fabrication.
    - a. Purpose.
    - b. Construction procedure.
    - c. Trimming the tray.
  4. Interim crowns.
    - a. Methods.
    - b. Construction of a temporary crown.
    - c. Trimming the crown.

### **Expanded Functions and Dental Materials**

The following behavioral objectives for the basic core content are divided into the cognitive, psychomotor and affective domains.

**A. Core content: didactic.**

Cognitive domain: Upon completion of the expanded functions and dental materials curriculum, the student will be able to:

1. Introduction to dental materials.
  - a. Summarize the reasons why a dental assistant should be knowledgeable in the science of dental materials.
  - b. Discuss some of the conditions that make the oral cavity hostile environment.
  - c. Identify four characteristics or properties a dental material must possess to survive in the oral environment.
  - d. Explain how the following organizations evaluate and/or classify dental drugs, materials, instruments and equipment:
    - (1) American Dental Association (ADA)
    - (2) U.S. Food and Drug Administration (FDA)
    - (3) International Standards Organization (ISO)
  - e. Name three ways dental materials may be classified and discuss each.
2. Materials science.
  - a. List the phases in which materials are classified. Discuss the varying amounts of attraction between the molecules and atoms of each phase. Recall the differentiating characteristics of each phase.
  - b. Explain the basic difference between primary and secondary bonds.
  - c. Name the three types of primary bonds and describe the differences among them.
  - d. Summarize the similarities and differences among secondary bonds, including permanent dipoles, hydrogen bonds and fluctuating dipoles.
  - e. Contrast the bonding characteristics of metals, ceramics, plastics and composites.
3. Physical and mechanical properties of materials.
  - a. Compare the properties of toughness and hardness, and provide examples.
  - b. Explain the difference between stress relaxation and creep.
  - c. Discuss the phenomenon of stress concentration, and compare its effects on a poorly placed amalgam restoration and on a properly placed one.

4. Adhesive materials.
  - a. Describe an adhesive.
  - b. Explain the difference between micromechanical bonding and macromechanical bonding, and provide an example of each type.
  - c. Recall three benefits the patient receives from restorations that are bonded to tooth structure.
  - d. Compare the differences in the microanatomy of enamel and of dentin regarding etching and bonding. The comparison should include the following terms:
    - (1) Orthophosphoric acid.
    - (2) Enamel tags.
    - (3) Smear layer.
    - (4) Primer.
    - (5) Adhesive.
  - e. Discuss two of the earlier fallacies about dentinal bonding and how research has changed current practice.
  - f. Summarize the main differences between glass ionomer cements and dentinal bonding.
5. Direct polymeric restorative materials.
  - a. Name the two types of polymerization reactions commonly seen in dental materials, and explain the meaning of "addition" in "addition polymerization."
  - b. Discuss the following properties of restorative resins:
    - (1) Polymerization shrinkage.
    - (2) Coefficient of thermal expansion.
    - (3) Abrasion resistance.
  - c. Summarize the relationship among a filler particle, the matrix and the coupling agent of a composite restorative material.
  - d. Compare the advantages and disadvantages of light-cure and chemical-cure composite materials.
  - e. Summarize the importance of the following properties in relation to the fillers (particles) found in dental composites:
    - (1) Composition.
    - (2) Size.
    - (3) Amount.
    - (4) Abrasion resistance.
    - (5) Refractive index.
    - (6) Clinical detection.
  - f. Choose one of the three types of dental composites and justify its use in the following dental situations:
    - (1) Bonding orthodontic brackets to enamel.
    - (2) Class V "gingival notch" restoration.
    - (3) Small Class I or II restoration.

- g. Discuss the role the dental assistant should play in the placement and maintenance of pit and fissure sealants.
  - h. Briefly describe preventive resin restoration and composite cements.
  - i. Assess the positive and negative characteristics of light-cure and chemical-cure glass ionomer cements.
  - j. Discuss the similarities among compomers, glass ionomers and composites.
- 6. Amalgam and direct metallic restorative materials.
  - a. Differentiate between an amalgam alloy and a dental amalgam.
  - b. Describe the composition of conventional and high-copper dental amalgams.
  - c. Describe the function (effects) of the major elements of dental amalgams.
  - d. Discuss the factors that affect the manipulation and performance of amalgam.
  - e. Describe acceptable mercury hygiene practices.
- 7. Dental cements.
  - a. Describe the use of dental cements as a:
    - (1) Luting agent.
    - (2) Base.
    - (3) Filling material.
    - (4) Temporary restoration.
    - (5) Intermediate restoration.
    - (6) Periodontal pack.
    - (7) Temporary cement.
  - b. Explain the importance of adhesion and microleakage to the clinical use of a dental cement.
  - c. Differentiate between a base and a liner.
  - d. Describe the use of a cavity varnish or cavity sealer.
  - e. Describe the relative properties of the component liquids and powders of dental cements.
  - f. Explain the setting reaction of typical dental cement.
  - g. Based on the properties of the liquid and the powder, discuss the properties of:
    - (1) ZOE cement.
    - (2) Zinc phosphate cement.
    - (3) Polycarboxylate cement.
    - (4) Glass ionomer cement.
    - (5) Composite cement.
      - (a) Hybrid cement.
    - (6) Calcium hydroxide base.
- 8. Impression materials.
  - a. Differentiate between a model, a cast and a die.
  - b. Differentiate between a preliminary and final impression.

- c. Describe the various types of impression trays.
  - d. List the desirable qualities of an impression material.
  - e. Differentiate between:
    - (1) Elastic and inelastic impression materials.
    - (2) Reversible and irreversible impression materials.
  - f. Describe the composition and setting mechanism of:
    - (1) ZOE cement.
    - (2) Agar or reversible hydrocolloid.
    - (3) Alginate.
    - (4) Condensation silicones.
    - (5) Polyethers.
    - (6) Addition silicones.
  - g. Compare the properties, use and cost of the above impression materials.
  - h. Describe the effect of water temperature on the setting rate of alginate.
9. Gypsum materials.
- a. Define the following terms: study model, cast and die.
  - b. Discuss the major differences among dental plaster, stone and improved stone.
  - c. Explain the meaning of initial and final setting times.
  - d. Give three examples of how to increase and decrease the setting times of gypsum products.
  - e. Discuss wet and dry strength as it relates to gypsum products.
  - f. Summarize the recommended technique for use of gypsum products for measuring, mixing and filling the impression. Include hand and vacuum mixing.
10. Materials for fixed indirect restorations and prostheses.
- a. Discuss the classification of fixed indirect restorations by both the amount of tooth structure restored and by material.
  - b. Discuss the factors that affect treatment planning for a fixed indirect restoration.
  - c. Describe the types of alloys used to make all-metal crowns, ceramometal crowns and partial denture frameworks.
  - d. Recall the types of porcelain used to simulate the color of teeth.
  - e. List the advantages and disadvantages of all-metal, ceramometal and all-ceramic restorations.
11. Removable prostheses and acrylic resins.
- a. List the uses of acrylic resins in dentistry.
  - b. Describe the function of the components of heat-cure and cold-cure acrylic resin systems.
  - c. Describe the steps involved in construction of a denture.
  - d. Summarize the procedures used to relines a denture.
  - e. Define "immediate denture."
  - f. Explain a dental assistant's role in maintenance of an acrylic prosthesis.

12. Discuss the rationale for integrating radiology and dental materials.
  - a. Identify various dental materials on a radiograph.
  - b. Explain why—radiographically—dental materials appear radiopaque or radiolucent.
  - c. Integrate the radiographic appearance of dental materials with clinical information to assess the patient's status of health or disease.
13. Polishing and abrasion.
  - a. Briefly define the following terms:
    - (1) Cutting.
    - (2) Abrasion.
    - (3) Finishing.
    - (4) Polishing.
    - (5) Abrasive.
  - b. Recall six common abrasives that may be used for clinical or laboratory procedures.
  - c. Summarize factors that may influence the rate of abrasion and explain why the dental assistant must have a clear understanding of these factors when providing patient care.
  - d. Discuss the reasons why tooth structure and restorations are polished.
  - e. Recall the details of the polishing process. Include the series of steps, scratches produced and wavelength of visible light.
  - f. Explain what it means to selectively polish.
14. Tooth whitening.
  - a. Define tooth whitening and explain the difference between vital and nonvital tooth whitening.
  - b. Explain the difference between intrinsic and extrinsic stains and list examples of each.
  - c. Identify two chemical agents used for vital tooth whitening and explain the process by which whitening agents whiten teeth.
  - d. Identify two chemical agents used for nonvital tooth whitening.
  - e. List the factors that affect the success of tooth whitening.
  - f. Compare and contrast patient-applied and professionally applied vital whitening.
  - g. Recall the two common side effects of tooth whitening and discuss the recommended treatment for alleviating them.
15. Oral appliances (including custom fluoride trays and mouth protectors).
  - a. List the different oral appliances used in dentistry.
  - b. Name the different thermoplastic materials used in the fabrication of oral appliances and discuss the properties of these materials.
  - c. Explain the steps involved in fabricating an oral appliance.
  - d. Describe the proper maintenance of oral appliances.
  - e. Prepare a script or dialogue that may be used for patient education regarding oral appliances.

16. Instruments as dental materials.
  - a. Explain the basic differences between carbon-steel and stainless-steel instruments.
  - b. Discuss the processes of passivation and electropolishing.
  - c. Summarize the problems or conditions that can affect instruments, including corrosion, rust, pitting, spotting and stains.
  - d. Explain why it is important to inspect instruments.
  - e. Explain the reasons for sharpening instruments and determine the appropriate time and frequency of sharpening.
  - f. Design an instrument maintenance schedule or cycle that could be used routinely in a private practice office setting.
17. Infection control and safety.
  - a. Describe an effective infection control protocol for handling impressions and dental appliances that are transferred between the dental operator and the dental laboratory within the dental office or to an outside commercial laboratory.
  - b. Discuss and demonstrate the procedure for disinfecting dental impressions.
  - c. Explain and demonstrate the procedure for disinfecting dentures and other dental appliances after they have been processed or adjusted.
  - d. Describe and apply the infection control protocol that must be followed when grinding or polishing dentures and other appliances.
  - e. Review the preferred method (or methods) of sterilizing or disinfecting instruments or items used during manipulation of dental materials and prostheses.
  - f. Describe the infectious, physical and chemical hazards in a dental office.
  - g. Recognize office and laboratory housekeeping practices that contribute to infection control and safety.
18. Interpret and evaluate dental materials and expanded functions literature and research findings.
19. Integrate knowledge from basic science and dental assisting science courses with dental materials content to assist in problem solving.
20. When presented a case study involving dental materials and expanded procedures knowledge, use critical thinking skills to assess, plan, implement and evaluate dental assisting care.



**Chairside dental procedures:**

- A. Select and describe how to prepare tray setups and all necessary armamentaria for chairside dentistry and dental emergency procedures, including but not limited to:
  - 1. Amalgam restorations.
  - 2. Composite restorations.
  - 3. Dental dam application.
  - 4. Occlusal equilibration/adjustment.
  - 5. Oral examination.
  - 6. Oral prophylaxis.
  - 7. Stainless steel crown placement/removal.
  - 8. Treatment of dry socket.
- B. Describe how to perform and/or assist with intraoral procedures, including but not limited to:
  - 1. Use the concepts of four-handed dentistry to describe how to assist with general dentistry and dental emergency procedures, including but not limited to:
    - a. Cavity preparation and restoration.
    - b. Crown and bridge restoration, preparation, temporization and cementation.
    - c. Occlusal equilibration/adjustment.
    - d. Oral prophylaxis.
    - e. Placement of stainless steel crowns.
    - f. Postoperative treatment and complications.
- C. Patient management.
  - 1. Demonstrate understanding of how to calm and reassure apprehensive patients.
  - 2. Describe how to manage patients, including patients with special needs, during routine clinical procedures.
  - 3. Describe how to monitor and record patient's response to drugs/medications.

**VII. Behavioral objectives for the following procedures:**

- A. Sealant placement.
  - 1. State indications and contraindications for the placement of sealant.
  - 2. Discuss sealant materials and their properties:
    - a. Opaque.
    - b. Clear.
    - c. Self-curing.
    - d. Light-curing.
  - 3. State the rationale for the use of a brush instead of a cup to clean the occlusal surface of teeth before conditioning.
  - 4. State the rationale for acid etching a tooth before placing an enamel sealant.

5. State the appearance of a tooth that has been properly acid etched.
  6. State the rationale for the use of colored protection from light-curing devices.
  7. Discuss the armamentarium and placement of an enamel sealant.
  8. Describe post-application inspection and acceptable criteria for an enamel sealant.
  9. Explain the rationale for fluoride application after sealant placement.
  10. Discuss tooth preparation for sealant replacement.
- B. Sedative temporary restorations.
1. State three reasons why a temporary restoration would be necessary for a patient.
  2. State two factors to be considered when determining the need for a temporary restoration.
  3. Name and discuss two types of temporary sedative restoration.
  4. List the armamentarium and procedure for mixing and placing a temporary sedative restoration.
- C. Amalgam polishing.
1. State two reasons why amalgam polishing may be necessary.
  2. State the time that must pass before polishing an amalgam.
  3. Explain the use of articulating paper before polishing an amalgam.
  4. State two reasons why undue heat build-up is not desirable during amalgam polishing.
  5. Describe the pressure and speed that must be applied during polishing procedures.
  6. State the criteria that an acceptable finish must meet after polishing an amalgam.
  7. Describe the use of the following methods for polishing amalgam fillings:
    - a. Green stone.
    - b. Rubber points and cups.
    - c. Pumice.
    - d. Tin oxide.
- D. Bite registration.
1. Discuss the rationale for taking a bite registration.
  2. Define centric occlusion.
  3. Discuss three types of bite registration material and technique.
  4. State the rationale for having the patient practice opening and closing before taking a bite registration.
  5. Describe the armamentarium and procedure for taking a wax bite registration.
- E. Chemotherapeutic agents.
1. State the rationale for use of each of the available agents.
  2. Discuss the selection process for appropriate patients.
  3. Identify the indications for particular medicament placement and preparation.

4. Discuss and list the contraindications for each agent.
5. Discuss the postoperative instructions for each agent.
- F. Temporary cementation.
  1. State two reasons for temporary cementation of a permanent or provisional crown.
  2. Name two agents used to cement provisional crowns.
  3. State a major reason why all cement should be carefully removed and rinsed from any restoration.
  4. Describe the armamentarium and procedure for cementation of a temporary crown.
- G. Dental dam
  1. Explain procedure to patient.
  2. Obtain proper armamentarium.
  3. Select appropriate clamp for area to be isolated.
  4. Secure dental dam, invert and ligate floss to frame.
- H. Caries detection.

Describe indications and conditions for the use of a shepherd's hook explorer, such as color, condition of restorations and open margins on teeth.

  1. Check margins of teeth with explorer.
  2. Place medicaments for identification interproximally.
  3. Explain purpose of caries detection to patient and dentist.
- I. Matrix retainer and wedge. Place retainer on selected tooth, with the smaller circumference toward the gingiva.
  1. Secure band and demonstrate tightening of inner and outer knobs.
  2. Place wooden wedge according to preparation with college plier (widest end to the gingiva).
  3. Evaluate for tissue trauma and make sure band is placed 1 mm beyond preparation.
  4. Remove and evaluate for trauma or overhanging materials.
- J. Temporary sedative restorations.
  1. Assemble proper armamentarium.
  2. Prepare mix with manufacturers suggestions for measuring and mixing.
  3. Adapt material to all walls of cavity prep and fill to slight excess.
  4. Shape anatomy, carve excess material and check occlusion.

**Core content: laboratory/clinical practice.**

- A. Cognitive domain—Upon completion of a dental materials and/or expanded functions curriculum, the student will be able to:
  1. Make impressions for study casts.
    - a. List the necessary armamentarium.
    - b. Explain proper tray preparation and correct manipulation of impression material.
    - c. Describe proper placement and removal of tray.
    - d. Explain proper storage of impression material.

2. Placing and removing temporary restorations.
  - a. Review types of temporary restorations.
  - b. List purpose for placement.
  - c. Describe proper preparation of material.
  - d. List steps in placement.
  - e. Describe proper removal including cement removal.
3. Fabrication and trimming of study models.
  - a. Identify preparation procedures.
  - b. Discuss the purpose(s) and indication(s) for fabricating a study model.
  - c. List the steps of pouring a model for both a single and double pour and the boxing wax technique.
  - d. List the steps in trimming a study model.
4. Pit and fissure sealants.
  - a. List the necessary armamentarium.
  - b. Discuss the purpose, indications and contraindications.
  - c. Recall the different types of sealant material.
  - d. List the steps in the sealant placement procedure.
  - e. Discuss the occlusal adjustment procedure after placing sealants.
  - f. Describe the evaluation process.
5. Whitening tray fabrication.
  - a. List the necessary armamentarium.
  - b. Recall the purpose, indication and contraindications.
  - c. List the clinical procedure that includes all appointments.
  - d. Discuss the steps in the laboratory procedure.
  - e. Describe any precautions that should be taken during tray construction.
6. Specialty procedures.
  - a. Periodontics.
    - (1) List the necessary armamentarium for placement and/or removal of:
      - (a) Retraction cord.
      - (b) Periodontal dressing.
    - (2) Recall the purpose, indication and contraindications for:
      - (a) Retraction cord.
      - (b) Periodontal dressing.
    - (3) Explain the steps in mixing periodontal dressing.
    - (4) Describe the steps for placement and/or removal of:
      - (a) Retraction cord.
      - (b) Periodontal dressing.
  - b. Endodontics.
    - (1) Describe the different types of pulp vitality testing.
    - (2) List the necessary armamentarium for all types of pulp vitality testing.

- (3) Recall the purpose, indication and contraindications for all types of pulp vitality testing.
    - (4) Discuss the steps of performing all types of pulp vitality testing.
  - c. Oral surgery.
    - (1) Describe the different types of sutures.
    - (2) List the necessary armamentarium for suture removal.
    - (3) Recall the purpose, indication and contraindications for suture removal.
    - (4) Discuss the steps to perform suture removal.
  - d. Orthodontics.
    - (1) Describe the wide variety of specific orthodontic procedures.
    - (2) Recall the purposes, indications and contraindications for all the specific orthodontic procedures.
    - (3) List the necessary armamentarium for each specific orthodontic procedure.
    - (4) Discuss the steps to performing each specific orthodontic procedure.
  - e. Nitrous oxide-oxygen analgesia.
    - (1) Recall the purposes, indications and contraindications for nitrous oxide-oxygen analgesia.
    - (2) List the necessary armamentarium for nitrous oxide-oxygen analgesia.
    - (3) Discuss the steps for performing nitrous oxide-oxygen analgesia.
- B. Psychomotor domain.

At the completion of the dental materials and/or expanded functions curriculum, the student will consistently be able to:

  - 1. Apply principles and techniques when proportioning and manipulating all dental materials that are within the dental assistant's scope of practice.
  - 2. Consider variables in manipulation of dental materials that may influence the desired outcome.
  - 3. Initiate or implement procedures to eliminate errors during manipulation of dental materials that are within the dental assistant's scope of practice.
  - 4. Appropriately manage all dental restorative materials during patient care.
  - 5. Apply principles of infection control and safety when manipulating dental materials.
- C. Affective domain.

At the completion of the curriculum, the student will be able to:

  - 1. Apply principles and techniques for evaluating results of dental materials selection.
  - 2. Self-assess ability consistently to perform additional dental assistant services at acceptable standards of care.

3. Use an objective approach in problem solving when manipulating dental materials and performing expanded function procedures.
4. Effectively communicate and display professional interpersonal skills.

## **VII. Sequencing**

The sequencing of courses in ethics, dental materials and expanded functions is critical in developing the appropriate knowledge base and laboratory/clinical skills to demonstrate competency. Although sequencing should be based on building knowledge and skill development, related information should be incorporated throughout the professional sequence of the semesters.

## **IX. Faculty**

Faculty responsible for courses in dental materials and expanded functions must have formal coursework and appropriate education methodology and experience as a clinician in all related areas. Additionally, the faculty must be licensed or credentialed appropriately to the state dental practice act in the state where the curriculum is offered. Faculty must possess the skill to develop courses and learning experiences leading to competency in the content areas identified. Faculty should also possess or be in the process of completing a minimum level of a baccalaureate degree.

## **X. Facilities**

The appropriate classroom, laboratory and clinical facilities must be available to accommodate the number of enrolled students with available faculty and resources. Recommended faculty-to-student ratios must be observed to ensure appropriate instruction and skill development.

### **1. Occupational Hazards**

Special care must be taken to provide a safe environment for individuals using or coming into contact with specific dental materials and equipment. Limitations exist within the practice setting that prevent the development of a complete listing of all potential occupational hazards and safety precautions. Manufacturers supply additional information on specific materials and equipment.

In addition, the Standard for Occupational Exposure to Bloodborne Pathogens by the OSHA is recommended in all laboratory and clinical areas. This includes the guidelines of standard precautions, safe handling of supplies and materials, elimination and/or reduction of physical hazards and chemicals and an established plan for emergencies.

## **XI. Bibliography**

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