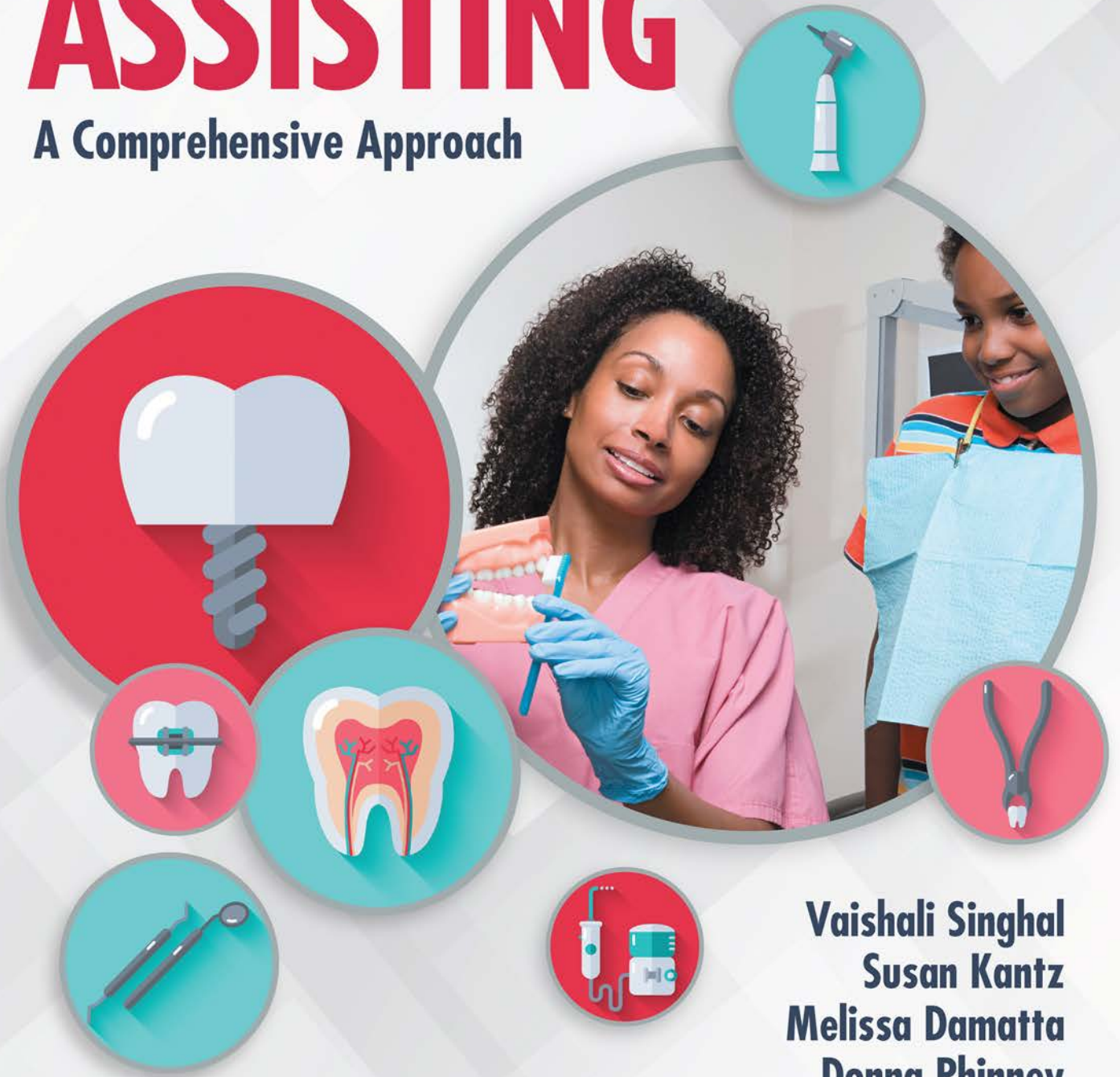


SIXTH EDITION

DENTAL ASSISTING

A Comprehensive Approach



Vaishali Singhal
Susan Kantz
Melissa Damatta
Donna Phinney
Judy Halstead



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Dedication

This book is dedicated to Judy Halstead and the memory of Donna Phinney. Donna and Judy's professionalism, expertise, and dedication to their students were the backbone of the first five editions. Their shared passion for Dental Assisting education created and sustained this text over the years, and we are proud to continue their legacy.

BRIEF CONTENTS

I DENTISTRY AS A PROFESSION

Introduction	Language of Dentistry	1
Chapter 1	Introduction to the Dental Profession	11
Chapter 2	Psychology, Communication, and Multicultural Interaction	31
Chapter 3	Ethics, Jurisprudence, and the Health Information Portability and Accountability Act	55

II DENTAL SCIENCES

Chapter 4	General Anatomy and Physiology	75
Chapter 5	Head and Neck Anatomy	123
Chapter 6	Landmarks of the Face and Oral Cavity	158
Chapter 7	Embryology and Histology	171
Chapter 8	Dental Anatomy	191
Chapter 9	Oral Pathology	225

III PRECLINICAL DENTAL SKILLS

Chapter 10	Microbiology	265
Chapter 11	Infection Control	291
Chapter 12	Management of Hazardous Materials	344
Chapter 13	The Special Needs and Medically Compromised Patient	368
Chapter 14	Pharmacology	399
Chapter 15	Medical Emergencies	431

IV PREVENTION AND NUTRITION

Chapter 16	Oral Health and Preventive Techniques	477
Chapter 17	Nutrition	515

V ASSIST WITH DIAGNOSIS AND PREVENTION

Chapter 18	The Dental Office	543
Chapter 19	Dental Instruments and Tray Systems	579
Chapter 20	Ergonomics and Instrument Transfer	628
Chapter 21	Moisture Control	654
Chapter 22	New Patient Examination	689
Chapter 23	Anesthesia and Sedation	723
Chapter 24	Oral Prophylaxis and Recare Appointment	752
Chapter 25	Coronal Polishing and Topical Fluoride Application	778

Chapter 26	Dental Sealants	806
-------------------	-----------------	-----

VI DENTAL RADIOGRAPHY

Chapter 27	Introduction to Dental Radiography, Radiographic Equipment, and Radiation Safety	821
Chapter 28	Dental Radiology Infection Control, Exposure, Processing and Evaluation of Dental Radiographs, and Mounting of Dental Radiographs	843
Chapter 29	Extraoral Radiography, Digital Radiography, and Radiographic Interpretation	907

VII ASSIST WITH RESTORATIVE PROCEDURES AND DENTAL MATERIALS

Chapter 30	Dental Emergency Procedures and Dental Cements	961
Chapter 31	Amalgam Procedures and Materials	991
Chapter 32	Composite Procedures and Materials	1028
Chapter 33	Dental Laboratory Materials	1048

VIII ASSIST WITH COMPREHENSIVE PATIENT CARE

Chapter 34	Pediatric Dentistry	1103
Chapter 35	Orthodontics	1130
Chapter 36	Oral and Maxillofacial Surgery	1186
Chapter 37	Endodontics	1218
Chapter 38	Periodontics	1249
Chapter 39	Dental Implants	1283
Chapter 40	Fixed Prosthodontics	1303
Chapter 41	Computerized Impression and Restorative Systems	1337
Chapter 42	Removable Prosthodontics	1346
Chapter 43	Cosmetic Dentistry and Teeth Whitening	1382

IX DENTAL PRACTICE MANAGEMENT

Chapter 44	Dental Practice Management	1395
Chapter 45	Career Planning	1447
	Glossary	1481
	Index	1489

LIST OF PROCEDURES

Chapter 9 Oral Pathology

- 9-1 The Extraoral and Intraoral Exams

Chapter 11 Infection Control

- 11-1 Clinical Handwashing
- 11-2 Using Alcohol-based Hand Rubs
- 11-3 Performing a Surgical Hand Scrub and Donning Surgical Gloves
- 11-4 Donning Gloves
- 11-5 Steps for Donning and Doffing PPE
- 11-6 Using an Ultrasonic Cleaner
- 11-7 Treatment of a Contaminated Tray
- 11-8 Operating a Steam Autoclave
- 11-9 Using a Dry Heat Sterilizer
- 11-10 Using an Unsaturated Chemical Vapor Sterilizer

Chapter 13 The Special Needs and Medically Compromised Patient

- 13-1 One Person Wheelchair Transfer
- 13-2 Two Person Wheelchair Transfer

Chapter 15 Medical Emergencies

- 15-1 Taking Blood Pressure
- 15-2 Measuring Radial Pulse
- 15-3 Observing and Recording Respiration

Chapter 16 Oral Health and Preventive Techniques

- 16-1 Toothbrushing Methods
- 16-2 Dental Flossing Technique
- 16-3 Applying Disclosing Agent for Biofilm Identification
- 16-4 Completing the Biofilm Control Record
- 16-5 Demonstrate Biofilm Removal Aids
- 16-6 Adult with Airway Obstruction
- 16-7 Treatment of a Patient with Syncope
- 16-8 Procedure to Treat a Patient with Asthma
- 16-9 Procedure to Treat the Hyperventilating Patient
- 16-10 Procedure for Treating of a Patient Experiencing Seizures

Chapter 18 The Dental Office

- 18-1 Positioning Patient Dental Chair
- 18-2 Daily Routine to Open the Office
- 18-3 Daily Routine to Close the Office
- 18-4 Seating the Dental Patient
- 18-5 Dismissing the Dental Patient

Chapter 19 Dental Instruments and Tray Systems

- 19-1 Identify Examination Instruments
- 19-2 Identify Expendable Materials
- 19-3 Identify Hand Cutting Instruments
- 19-4 Identify Amalgam Restorative Instruments
- 19-5 Identify Composite Restorative Instruments
- 19-6 Identify Accessory Restorative Instruments

- 19-7 Identification of Dental Burs
- 19-8 Identification of Abrasive and Polishing Rotary Instruments
- 19-9 Identify and Attach Dental Handpieces, Handpiece Attachments, and Rotary Instruments

Chapter 20 Ergonomics and Instrument Transfer

- 20-1 Single-Handed Pen Grasp Double Instrument Transfer
- 20-2 Two-Handed Palm Grasp Double Instrument Transfer

Chapter 21 Moisture Control

- 21-1 Positioning and Placement of HVE
- 21-2 Preparing the Dental Dam Setup
- 21-3 Assist Operator in Placing Clamp before Dental Dam

Chapter 22 New Patient Examination

- 22-1 Procedure Taking Blood Pressure Using Automated Wrist Cuff
- 22-2 Taking an Oral Temperature Using a Digital Thermometer
- 22-3 Taking a Tympanic Temperature
- 22-4 Taking Intraoral Images
- 22-5 Assist with New Patient Examination

Chapter 23 Anesthesia and Sedation

- 23-1 Assembling the Local Anesthetic Syringe
- 23-2 Assisting with the Administration of Topical and Local Anesthesia
- 23-3 Disassembling a Dental Local Anesthetic Needle
- 23-4 Assisting with the Administration of Nitrous Oxide

Chapter 24 Oral Prophylaxis and Recare Appointment

- 24-1 Comprehensive Periodontal Charting
- 24-2 Assisting During Oral Prophylaxis
- 24-3 Assisting During Scaling and Root Planing

Chapter 25 Coronal Polishing and Topical Fluoride Application

- 25-1 Coronal Polishing—Rubber Cup Technique
- 25-2 Polishing with Air-Powder Polish
- 25-3 Topical Fluoride Application—Tray Technique
- 25-4 Topical Fluoride Application—Varnish Technique

Chapter 26 Dental Sealants

- 26-1 Placing Photopolymerized Dental Sealants

Chapter 28 Dental Radiology Infection Control, Exposure, Processing and Evaluation of Dental Radiographs, and Mounting of Dental Radiographs

- 28-1 Infection Control Before, During, and After Exposure
- 28-2 Exposure of a Full Mouth Series of Radiographs Using the Paralleling Technique
- 28-3 Full Mouth Series Exposure with Bisecting-the-Angle Technique
- 28-4 Adult Occlusal Exposures

- 28-5 Pediatric Occlusal Images
- 28-6 Pediatric Periapical and Bitewing Exposures
- 28-7 Automatic Processing of Films in an Autoprocessor with a Daylight Loader (Peri-Pro)
- 28-8 Mounting Traditional Films
- 28-9 Steps in Film Duplication

Chapter 29 Extraoral Radiography, Digital Radiography, and Radiographic Interpretation

- 29-1 Panoramic Exposure
- 29-2 Digital Radiography Techniques

Chapter 30 Dental Emergency Procedures and Dental Cements

- 30-1 Mixing Zinc Phosphate Cement
- 30-2 Mixing Zinc Oxide–Eugenol Cement—Powder/Liquid Form
- 30-3 Mixing Zinc Oxide–Eugenol Cement—Two-Paste System
- 30-4 Mixing Polycarboxylate Cement
- 30-5 Mixing Glass Ionomer Cement
- 30-6 Assisting with a Temporary Cement Restoration

Chapter 31 Amalgam Procedures and Materials

- 31-1 Placing Cement Bases
- 31-2 Placing Calcium Hydroxide Cement Liner—Two-Paste System
- 31-3 Placing a Cavity Varnish
- 31-4 Placing a Self-Curing Amalgam Bonding Agent
- 31-5 Assembly of the Universal Matrix and Retainer
- 31-6 Placement and Removal of the Universal Matrix
- 31-7 Triturating Dental Amalgam
- 31-8 Assisting with a Class II Amalgam Restoration
- 31-9 Assisting with Finishing and Polishing an Amalgam Restoration

Chapter 32 Composite Procedures and Materials

- 32-1 Placing Light-Cured Glass Ionomer Cavity Liner
- 32-2 Placing the Etchant
- 32-3 Placing the Bonding Agent
- 32-4 Placement and Removal of the Matrix Strip
- 32-5 Assisting with a Class III Composite Restoration

Chapter 33 Dental Laboratory Materials

- 33-1 Mixing Alginate with an Alginate II Mixing Device
- 33-2 Mixing an Alginate Impression and Loading Impression Tray
- 33-3 Taking an Alginate Impression
- 33-4 Taking a Bite Registration
- 33-5 Taking a Polyether Impression
- 33-6 Taking a Silicone (Polysiloxane) Two-Step Impression
- 33-7 Mixing Plaster for an Alginate Impression
- 33-8 Pouring Anatomic Portion of Plaster Study Model
- 33-9 Pouring Art Portion of Plaster Study Model Using Double-Pour Method
- 33-10 Removing Plaster Model from Alginate Impression
- 33-11 Trimming Diagnostic Casts/Study Models
- 33-12 Performing a Facebow Transfer

- 33-13 Mounting Models on an Articulator after Facebow Records Have Been Completed
- 33-14 Constructing a Self-Curing Acrylic Resin Custom Tray
- 33-15 Constructing a Vacuum-Formed Acrylic Resin Custom Tray
- 33-16 Sizing, Adapting, and Seating Aluminum Temporary Crown
- 33-17 Cementing the Aluminum Crown
- 33-18 Sizing, Adapting, and Seating a Preformed Acrylic Crown
- 33-19 Develop or Place a Pontic in a Model for a Three-Unit Bridge on a Dental Model; Adapt a Matrix; Make, Trim, and Fit the Three-Unit Provisional Bridge
- 33-20 Preparing a Full Crown Provisional on a Lower Left Molar on a Patient
- 33-21 Cementing Custom Self-Curing Composite Temporary Crown

Chapter 34 Pediatric Dentistry

- 34-1 T-Band Placement
- 34-2 Stainless Steel Crown Placement
- 34-3 Assisting with a Pulpotomy

Chapter 35 Orthodontics

- 35-1 Assisting in the Placement and Removal of Separators
- 35-2 Assisting with Cementation of Orthodontic Bands
- 35-3 Assisting with Direct Bonding of Brackets
- 35-4 Assisting in Insertion of First Orthodontic Wire
- 35-5 Retie Appointment
- 35-6 Assist with Debanding/Debonding Appointment for Removal of the Braces

Chapter 36 Oral and Maxillofacial Surgery

- 36-1 Assisting with Routine Extraction
- 36-2 Assisting with Multiple Extractions
- 36-3 Assisting with Extraction of Impacted Tooth
- 36-4 Assisting with Suture Removal
- 36-5 Assisting with Treatment of Alveolitis

Chapter 37 Endodontics

- 37-1 Assist in Pulpal Disease Diagnosis
- 37-2 Assist in Root Canal Therapy (Cold Lateral Condensation Technique)

Chapter 38 Periodontics

- 38-1 Occlusal Adjustment
- 38-2 Gingivectomy
- 38-3 Osseous Surgery
- 38-4 Preparation and Placement of Noneugenol Periodontal Dressing
- 38-5 Removal of Periodontal Dressing

Chapter 39 Dental Implants

- 39-1 Two-Stage Implant Technique

Chapter 40 Fixed Prosthodontics

- 40-1 Placing and Removing Retraction Cord—Advanced Chairside Function
- 40-2 Porcelain Veneers
- 40-3 Gold Crown Preparation

Chapter 41 Computerized Impression and Restorative Systems

- 41-1 CAD/CAM Restoration

Chapter 42 Removable Prosthodontics

- 42-1 Fabrication of Partial Dentures
- 42-2 Full Dentures Fabrication
- 42-3 Chairside Denture Reline
- 42-4 Laboratory Denture Reline

Chapter 43 Cosmetic Dentistry and Teeth Whitening

- 43-1 Professional In-Office Whitening for Vital Teeth

Chapter 44 Dental Practice Management

- 44-1 Preparing for the Day's Appointments
- 44-2 Reordering Supplies
- 44-3 Posting Patient Charges
- 44-4 Balancing Day Sheets
- 44-5 Preparing a Deposit Slip
- 44-6 Reconciling a Bank Statement
- 44-7 Writing a Business Check
- 44-8 Filing Insurance Claims

Chapter 45 Career Planning

- 45-1 Preparing a Cover Letter
- 45-2 Preparing a Professional Resume
- 45-3 Preparing a Follow-up Letter

CONTENTS

INTRODUCTION Language of Dentistry 1

Dental Terminology 1

Word Parts 2

Root Words 2 • Affixes 2 • Suffixes 2 • Prefixes 3

Strategy for Building Dental Vocabulary 4

Break the Word into Its Parts 5 • Define the Meaning of Each Word Part 5 • Put the Parts Together 5
• Assemble the Meaning 6 • Use Your Senses 6
• Make It Meaningful 6

Pronunciation 6

Plurals 7

Acronyms/Eponyms/Homonyms 7

Acronyms 7 • Eponyms 7 • Homonyms 8

Key Terms: Definitions and Pronunciation 9

Review Questions 9 • Critical Thinking 10 • Key Terms 10

SECTION I Dentistry as a Profession

CHAPTER 1 Introduction to the Dental Profession 11

Introduction 11

History of Dentistry 11

Later Progress of Dentistry 13

Progress of Dentistry in the United States 13

Education and Organized Dentistry 14

American Dental Association 16

Advances in Equipment and Pharmaceuticals 17

High-Speed Handpiece 17 • Sit-Down Dentistry 18
• Infection Control and Prevention 18
• Nitrous Oxide 19 • Local Anesthesia 19
• Advances in Imaging 19 • Advances in Techniques 20
• Dental Specialties 20

Advances in Restorative Options 20

Roles and Duties of the Dental Team Members 21

Direct Care Dental Team 21 • Dentist (DDS or DMD) 21 • Dental Hygienist (RDH or LDH) 22 • Dental Assistant 22 • Dental Assisting Career Opportunities 23
• Earning DANB Certification 23 • Duties of the Expanded Functions Dental Assistant (EFDA) 23
• Indirect Care Dental Team 24 • Dental Business Assistant 24 • Certified Dental Laboratory Technician (CDT) 24 • Dental Products Salesperson 25
• Dental Educator 25 • Other Members of the Dental Team 25

Chapter Summary 25

Case Study 25 • Review Questions 26
• Critical Thinking 26 • Key Terms 26

CHAPTER 2 Psychology, Communication, and Multicultural Interaction 31

Introduction 31

Psychology 32

Psychology in Dentistry 32

Health Behavior Theories 32

Stages of Change Theory (Transtheoretical Model) 33 • Social Learning Theory

(Social Cognitive Theory) 33 • Health Belief Model 33
• Learning Ladder 34 • Maslow's Hierarchy of Needs 34

Components of the Communication Process 36

Oral Communication 37 • Listening Skills 37

Defense Mechanisms 40

Dental Phobias 40

Communicating with Patients, Staff, and Other Professionals 40

The Different Generations 40 • Stress in the Dental Office 43 • Culture, Ethnicity, and Race 43 • Multicultural Interaction 45 • Written Communication 45

Letters 46 • Newsletters 46 • Patient Records 46
• Office Policy Manual 46 • Electronic Messaging 46
• Script Development 46

Effective Writing 46

Preparing a Dental Presentation 47

Types of Oral Presentations 47 • Preparing a Table Clinic Presentation 47

Creating Good Visuals 48

Backdrop 49 • Title 49 • Content 49 • Design 49
• Handouts 50

Delivering the Presentation 50

Dress 50 • Body Language 50 • Speaking 50

Chapter Summary 51

Case Study 51 • Review Questions 51
• Critical Thinking 53 • Key Terms 53

CHAPTER 3 Ethics, Jurisprudence, and the Health Information Portability and Accountability Act 55

Introduction 55

Ethics for the Dental Assistant 56

License to Practice 56 • Societal Trust 57
• Confidentiality 57 • Ethical Principles 58 • Ethical Dilemmas 58 • Dental Jurisprudence for the Dental Assistant 59 • Regulatory versus Nonregulatory Agencies 61 • Insurance Relations 66 • Legal Relations 66 • HIPAA in Public Health 66 • Emergency Care 66 • Correctional Dentistry 67 • Education 67
• HIPAA in Technology 67

Chapter Summary 69

Case Study 69 • Review Questions 69 • Critical Thinking 71 • Key Terms 71

SECTION II Dental Sciences

CHAPTER 4 General Anatomy and Physiology 75

Introduction to Anatomy and Physiology 75

Organization of the Human Body 75

Cell 77 • Tissue 78 • Organs 78 • Body Systems 78

Body Locations and Directions 79

Anatomical Position 79 • Body Planes 79 • Body Cavities 79 • Directional Terms of the Body 79
• Interrelationship Between Oral Health and the Body 80

Skeletal System 80

Anatomy of Bones 81 • Functions of Bones 82
 • Categories of Bones 82 • Divisions of the Skeleton 82
 • Types of Joints 82 • Common Diseases and Conditions of the Skeletal System 82

Muscular System 83

Anatomy of Muscles 83 • Types of Muscles 84
 • Physiology of Skeletal Muscles 87 • Muscle Function 88 • Common Conditions and Diseases of the Muscular System 88

Nervous System 88

Structure of the Nervous System 89 • Central Nervous System (CNS) 89 • Peripheral Nervous System (PNS) 90
 • Common Diseases of the Nervous System 90

Endocrine System 93

Function of the Endocrine System 93

Endocrine Glands 93

Common Diseases and Conditions of the Endocrine and Reproductive Systems 94

Reproductive System 95

Female Reproductive System 95 • Male Reproductive System 96 • Common Diseases and Conditions of the Reproductive Systems 97

Cardiovascular System 97

The Heart 97 • Blood Vessels 100 • Components of Blood 100 • Common Diseases and Conditions of the Cardiovascular System 102

Digestive System 103

Route of Digestion 103 • Accessory Organs 105
 • Common Diseases and Conditions of the Digestive System 105

Respiratory System 105

Anatomy and Physiology of the Respiratory System 106
 • Respiratory Process 107 • Respiratory Muscles 107
 • Respiration Rate 107 • Common Diseases of the Respiratory System 108

Lymphatic System 108

Anatomy and Physiology of the Lymphatic System 108
 • Common Diseases and Conditions of the Lymphatic and Immune Systems 109

Integumentary System 109

Functions of the Integumentary System 109 • Layers of the Skin 110 • Accessory Organs 111 • Diseases and Conditions of the Integumentary System 111

Urinary System 112

Functions of the Urinary System 112 • Organs of the Urinary System 112 • Composition of Urine 112
 • Common Diseases and Conditions of the Urinary System 112

Chapter Summary 114

Case Study 114 • Review Questions 114 • Critical Thinking 115 • Key Terms 116

CHAPTER 5 Head and Neck Anatomy 123**Introduction 123****Bones of the Cranium 123**

Bones of the Neurocranium 123 • Bones of the Viscerocranium 127

Temporomandibular Joint (TMJ) 130

Temporal Bone Section 130 • Mandible Bone Section 130

Muscles of the Head and Neck 130

Muscles of Mastication 130 • Muscles of Facial Expression 131 • Muscles of the Tongue and Floor of the Mouth 132 • Muscles of the Soft Palate 133 • Muscles of the Neck 133

Tongue and Salivary Glands 135

Body: Dorsal Surface: Tongue Structure 135 • Body: Ventral Surface: Tongue Structure 136
 • Base of Tongue 137 • Function of Saliva 137 • Major Salivary Glands 138 • Minor Salivary Glands 138

Nerves of the Head and Neck 139

Cranial Nerves 139 • Branches of the Trigeminal Nerve 139

Circulation of the Head and Neck 141

Pathway of Blood to the Head 141 • Branches of Veins Important to Dentistry 141 • Head and Neck Lymph Nodes 141

Chapter Summary 150

Case Study 151 • Review Questions 151 • Critical Thinking 152 • Key Terms 152

CHAPTER 6 Landmarks of the Face and Oral Cavity 158**Introduction 158****Landmarks of the Face and Oral Cavity 158**

Landmarks of the Face 158

Divisions of the Oral Cavity 159

Vestibule 159 • Oral Cavity Proper 160

Chapter Summary 166

Review Questions 166 • Critical Thinking 168 • Key Terms 168

CHAPTER 7 Embryology and Histology 171**Introduction 171****Development of the Orofacial Complex 172**

Prenatal Development: Stage 1 Germinal Stage 172
 • Prenatal Development: Stage 2 Embryonic Stage 172
 • Prenatal Development: Stage 3 Fetal Stage 172

Development of the Oral Cavity and Face 173

Pharyngeal Arches 174 • Hard Palate Formation 174

Tooth Development: Odontogenesis 176

Dental Lamina 176

Stages of Tooth Development 176

Bud Stage 177 • Cap Stage 177 • Bell Stage 177
 • Appositional Stage 178 • Dentinogenesis 179
 • Cementogenesis 180 • The Pulp 180 • Artifacts of Enamel, Dentin, Cementum, and Pulp 181 • Parts of a Tooth 182

Periodontium 183

Attachment Unit 183

Cementum 185

Periodontal Ligament (PDL) Components 185 • Gingival Unit 185 • Gingival Unit Fibers 186

Chapter Summary 187

Review Questions 187 • Critical Thinking 188 • Key Terms 188

CHAPTER 8 Dental Anatomy 191**Introduction 191****Types of Teeth and Their Functions 191**

Incisors 191 • Canines 191 • Premolars 192
 • Molars 192

Dental Arches 192

Dental Quadrants 192 • Dental Sextants 193

Dentition Periods 193

Primary Dentition 193 • Mixed Dentition 194
 • Permanent Dentition 194

Surfaces of the Teeth	194
Points of Reference	196
Line Angles and Point Angles	197 • Divisions into Thirds 197
Tooth Morphology	198
Anatomic Landmarks of Anterior Teeth	198
• Elevations	198 • Depressions 198 • Contact Areas 198
Anterior Permanent Dentition	199
Maxillary Central Incisor	199 • Mandibular Central Incisor 199 • Maxillary Lateral Incisor 201 • Mandibular Lateral Incisor 202 • Maxillary Canines 202 • Mandibular Canine 204
Posterior Permanent Dentition	205
Premolars	206 • Molars 210
Universal Numbering System	214
Primary Dentition	214
Importance of Primary Teeth	214 • Comparison of Primary and Permanent Teeth 215 • D. Maxillary Central Incisor 216 • D. Maxillary Lateral Incisor 216 • D. Maxillary Canine 216 • D. Maxillary First Molar 217 • D. Maxillary Second Molar 217 • D. Mandibular Central Incisor 217 • D. Mandibular Lateral Incisor 218 • D. Mandibular Canine 218 • D. Mandibular First Molar 218 • D. Mandibular Second Molar 219
Chapter Summary	219
Case Study	219 • Review Questions 220 • Critical Thinking 221 • Key Terms 221

CHAPTER 9 Oral Pathology 225

Introduction to Oral Pathology	226
Diagnosis of Lesions	226
Clinical Diagnosis	226 • Radiographic Diagnosis 227 • Historical Diagnosis 228 • Laboratory, Microscopic, and Surgical Diagnoses 228 • Therapeutic Diagnosis 228 • Differential Diagnosis 228 • Final Diagnosis 228
Inflammatory Process	228
Initiation Phase	229 • Amplification Phase 229 • Termination Phase 229
Classification of Lesions by Location	229
Lesions Classified above the Surface of the Oral Mucosa	229 • Lesions Classified below the Surface of the Oral Mucosa 229 • Lesions Classified as Flat or Even with the Surface of the Oral Mucosa 229
Infectious Diseases of the Tooth	229
Dental Caries Process	229 • Rampant Caries 233 • Prevention and Treatment of Dental Caries 234
Lesions of the Oral Cavity Caused by Biological Agents	235
Actinomycosis	235 • Herpes Simplex Virus 235 • Aphthous Ulcers 236 • Herpes Zoster (Shingles) 236 • Syphilis 236 • Candida Albicans 237 • Cellulitis 238
Developmental Disturbances of the Teeth	238
Amelogenesis Imperfecta	238 • Dentinogenesis Imperfecta 239 • Ankylosis 239 • Anodontia and Hypodontia 239 • Fusion 239 • Gemination 239 • Macrodontia/Microdontia 240 • Supernumerary Teeth 240 • Dens in Dente 240
Anomalies of the Tongue	240
Fissured Tongue	240 • Bifid Tongue 240 • Ankyloglossia 240 • Geographic Tongue 241
Lesions Produced by Chemical Agents	241
Aspirin Burns	241 • Nicotine Stomatitis 241 • Chewing Tobacco Lesion 242 • Black Hairly Tongue 242 • Gingival Hyperplasia 242

Lesions Produced by Physical Agents	243
Mucocele/Ranula	243 • Denture Induced Hyperplasia 243 • Amalgam Tattoo and Oral Piercings 243
Oral Conditions Related to Hormonal Imbalances	245
Lesions Caused by Nutritional Deficiencies	245
Angular Cheilitis	245 • Glossitis 245 • Anorexia Nervosa and Bulimia 245
Neoplasms	245
Benign Neoplasms	246 • Malignant Neoplasms 247 • Common Sites for Oral Cancer 249 • Stages of Cancer 249 • Warning Signs of Oral Cancer 249
Precancerous Lesions	249
Leukoplakia	249 • Erythroplakia 249 • Lichen Planus 250
Oral Lesions Related to HIV and AIDS	250
Candida Albicans	250 • Periodontal Disease 251 • Herpetic Lesions 251 • Hairy Leukoplakia 251 • Oral Ulcerations 251 • Kaposi's Sarcoma 251 • Lesions Caused by the Human Papilloma Virus 252
Oral Cancer Screening	252
Steps in Oral Cancer Screening Procedure	252
Teaching Your Patient to Do Oral Cancer Self-Screening	256
Types of Diagnostic Tools Available for Oral Cancer Screening	256
OralCDx Brush Test®	257 • ViziLite® and Vizilite TBlue® 257 • VELscope® 257
Caring for Patients Undergoing Cancer Treatment	257
Types of Treatment	257 • Patient Treatment Prior to Radiation Therapy 258 • Patient Treatment during Radiation Therapy 258 • Patient Treatment after Radiation Therapy 258
Chapter Summary	260
Case Study	260 • Review Questions 261 • Critical Thinking 262 • Key Terms 262

SECTION III Preclinical Dental Skills

CHAPTER 10 Microbiology 265

Introduction	265
History of Microbiology	266
Infectious Diseases	266
Pathogenicity	266 • Acute and Chronic Diseases 266 • Latent Diseases 266 • Opportunistic Diseases 267
Groups of Microorganisms	267
Bacteria	267
Viruses	269 • Protozoa 269 • Fungi 269 • Rickettsiae 269 • Algae 269
Prions	270
Normal Flora	270
Benefits of Normal Flora	270
Diseases Caused by Microorganisms	270
Bacterial Diseases	270 • Viral Diseases 272 • Protozoal Diseases 277 • Fungal Diseases 278 • Rickettsial Diseases 278 • Prion Diseases 278 • Harmful Effects of Normal Flora 279
The Body's Resistance to Disease	280
Nonspecific Defenses	280 • Specific Defenses 281
Immunity	281
Innate Immunity	281 • Adaptive Immunity 281 • Vaccines 281

Epidemiology	282
Chapter Summary	282
Case Study	282 • Review Questions 283 • Critical Thinking 284 • Key Terms 284

CHAPTER 11 Infection Control 291

Aseptic Technique	292
Asepsis Steps	292
Hand Hygiene	292
Hand Hygiene Techniques	292 • Hand Care 297
Personal Protective Equipment (PPE)	300
Types of Gloves Used in Dentistry	300 • Protective Clothing 304 • Masks 305 • Protective Eyewear 305
Changes in PPE related to COVID-19 pandemic	306
Donning and Doffing PPE	307
Surface Sanitization	308
Housekeeping Surfaces	308 • Clinical Contact Surfaces 310
Patient Treatment Instruments	315
Single Use Items	315 • Instrument Processing Area 315
Processing of Contaminated Dental Instruments	315
Ultrasonic General Cleaning	316 • Automated Washing/Disinfectors 319 • Handscrubbing Dental Instruments 319 • Procedures for More Difficult Stains 319 • Treatment of Contaminated Tray in Sterilization Area 319
Disinfection Protocols	322
Classification of Instruments and Procedures	322
Disinfectant Categories	322
Chemicals Not EPA Registered as Disinfectant	324
Disinfecting Procedures	324
Disinfecting Clinical Contact Surfaces	326 • Disinfecting Transfer Surfaces 326 • Disinfecting Contaminated Instruments 326 • Factors Affecting Disinfectant Efficiency 326 • Disinfecting Waterlines 326 • Disinfecting Dental Vacuum Systems 328
Sterilization	329
Preparation and Packaging for Sterilization	329 • Methods of Sterilization 330 • Corrosion Control 334 • Handpiece Sterilization 335 • Factors Affecting Sterilization 336 • Monitoring Sterilization 336 • Sterilization Protocol 337
Guidelines for Infection Control in Dentistry	338
Nonregulatory Agencies and Infection Control	338 • Regulatory Agencies 339
Chapter Summary	340
Case Study	340 • Review Questions 340 • Critical Thinking 342 • Key Terms 342

CHAPTER 12 Management of Hazardous Materials 344

Introduction	344
OSHA's Bloodborne Pathogen Standard	348
Exposure Control Plan	348 • Goals and Objectives 348 • OSHA Compliance Directive 349 • Engineering/Work Practice Controls 349 • Occupational Exposure to Bloodborne Pathogens 350 • Documentation of Exposure Incident 351
Employee Work Site Safety	352
Broken Glass	352 • Laundry 352 • Hazardous Chemicals 352

OSHA's Hazardous Communication Standard (HCS)	353
Safety Data Sheets	353 • Harmonized Label 353 • Chemical Warning Label Determination 354 • Quality Assurance/Updates 354
Evacuation Plans and Fire Extinguishers	363
Chapter Summary	365
Case Study	365 • Review Questions 366 • Critical Thinking 367

CHAPTER 13 The Special Needs and Medically Compromised Patient 368

Introduction	368
The Patient with Special Needs	368
The Americans with Disabilities Act	369
General Treatment Considerations	369
Assessment, Planning, and Scheduling	369 • Patient Care Modification 369 • Protective Body Stabilization 371 • Use of a Mouth Prop 371
The Patient Who Uses a Wheelchair	371
Wheelchair Transfer	372 • Ergonomics for Wheelchair Transfer 372 • Providing Treatment in the Wheelchair 376
Sensory Disabilities	376
Vision Impairment	376 • Deaf or Hard of Hearing 377
Intellectual and Physical Disabilities	377
Intellectual Disabilities	377 • Physical Disabilities 378
The Medically Compromised Patient	378
The Pregnant Patient	380 • The Older Patient 380 • Cardiovascular Diseases 381 • Neurologic Disorders 384
Blood Disorders	386
Red Blood Cell Disorders	386 • Musculoskeletal Disorders 387 • Endocrine Disorders 388 • Psychiatric Disorders 388 • Kidney Disease 390 • Respiratory Disorders 390 • Cancer 391 • HIV/AIDS 392
Chapter Summary	393
Case Study	393 • Review Questions 393 • Critical Thinking 395 • Key Terms 395

CHAPTER 14 Pharmacology 399

Introduction	400
Why Study Pharmacology?	400
Scope of Dental Therapeutics	401
Drug Laws	401
Drug Development and Testing	401
Sources of Drugs	402 • Drug Names 402
Drug References	402
Dosages and Routes of Administration	403
Calculating Dosages	403 • Routes of Administration 403
Drug Processing by the Body	405
Absorption	405 • Distribution 405 • Metabolism 405 • Excretion 406
Writing a Prescription	407
Parts of the Prescription	407 • Abbreviations and Units of Measure 407 • Computer Generated Prescriptions 408

Laws Governing Prescriptions 409

- Who May Write a Prescription? 409
- Documentation 409 • Patient Information 409 • Controlled Substances 409

Substance Use disorder 410

- Recognizing Prescription Seeking Behaviors 410
- Protecting the Office against Drug Diversion 411

Therapeutic versus Adverse Drug Effects 411

- Types of Adverse Reactions 411

Commonly Used Medications in Dentistry 414

- Anesthetics 414 • Anti-Anxiety and Sedative Medications 416 • Analgesics 417 • Anti-Infective Drugs 418

Patient Risk Assessment 421

- ASA Classification System 421

Dental Implications of Medications for Systemic Disease 421

- Cardiovascular Medications 421 • Endocrine Medications 423 • Psychiatric Medications 424 • Medications for Neurological Disorders 424 • Cancer Chemotherapy 424 • Osteoporosis 425 • Medications Used to Treat Substance Use Disorders 425

Chapter Summary 425

- Case Study 426 • Review Questions 426 • Critical Thinking 428 • Key Terms 428

CHAPTER 15 Medical Emergencies 431**Introduction 432****Prevention 432****Medical History 432**

- Vital Signs 432

Anxious Patients 438**American Society of Anesthesiologist (ASA)****Classification 438**

- Medical Consult 438

Staff and Office Preparation 439

- Basic Emergency Kit 440 • Optional Emergency Kit Items 440 • Team Effort in Emergency Management 440

Syncope 442

- Vasovagal Syncope 442 • Postural Hypotension 443

Respiratory Disorders 444

- Asthma 445 • Hyperventilation 446 • Chronic Obstructive Pulmonary Disease (COPD) 446

Adrenal Disorders 447

- Acute Adrenal Insufficiency 447 • Medical History and Prevention and of Acute Adrenal Insufficiency 447 • Management of an Acute Adrenal Crisis in the Dental Office 450

Thyroid Disorders 450

- Thyroid Anatomy 450 • Hormones Produced by the Thyroid Gland 450 • Hyperthyroidism and Hypothyroidism 451 • Medical History and Prevention of Thyroid Disorder Related Medical Emergencies 451 • Management of Thyroid Disorders in the Dental Office 452

Diabetes 452

- Types of Diabetes 452 • Acute and Chronic Complications of Diabetes 454 • Management of Diabetes 454 • Medical History and Prevention of Diabetic Complications in the Dental Office 454 • Management of the Diabetic Patient in the Dental Office 455

Angina and Myocardial Infarction 455

- Angina 455 • Management of a Patient with a History of Angina 457 • Myocardial Infarction 457

Cardiac Arrest 459

- Basic Life Support 459

Congestive Heart Failure 460

- Causes of Congestive Heart Failure 460 • Medical History and Prevention of an Emergency Related to Congestive Heart Failure 460 • ASA Classifications 460 • Dental Management of the Patient with Congestive Heart Failure 460 • Management of Acute Pulmonary Edema in the Dental Office 460

Epilepsy and Seizures 461

- Generalized Seizures 462 • Causes of Epilepsy and Seizures 463 • Medical History and Prevention of Seizures in the Dental Office 463 • Management of Epilepsy and Seizures in the Dental Office 463

Cerebrovascular Accident 463

- Types of Cerebrovascular Accidents 464 • Predisposing Factors to a Cerebrovascular Accident 464 • Medical History and Prevention of a Cerebrovascular Accident 464 • Dental Management of the Patient with a History of a Cerebrovascular Accident 465 • Management of a Cerebrovascular Accident in the Dental Office 466

Allergic Reactions 467

- Physiology of an Allergic Reaction 467 • Common Dental Allergens 468 • Medical History and Prevention of an Allergic Reaction 468 • Management of an Allergic Reaction in the Dental Office 468

Airway Obstruction 469**The Role of the Dental Assistant in Managing a Medical Emergency 469****Chapter Summary 470**

- Case Study 470 • Review Questions 471 • Critical Thinking 472 • Key Terms 473

SECTION IV Prevention and Nutrition**CHAPTER 16 Oral Health and Preventive Techniques 477****Introduction 477****Dental Disease 478**

- Soft and Hard Deposits 478

Preventive Dentistry 479

- Patient Motivation 479 • Age Characteristics 479 • Home Care 479 • Fluoride 480 • Dental Sealants 480

Biofilm Control and Oral Self-Care 481**Manual Tooth Brushing 481**

- Brushing Tips for Best Results 481 • Toothbrush Methods That Cause Harm 482 • Toothbrush Care 482 • Methods for Manual Tooth Brushing 482 • Tongue Brushing 482

Dentifrices 482

- Types of Dentifrice 482

Dental Floss 485

- Types of Dental Floss 485 • Dental Flossing Technique 486

Oral Self-Care Assessments 488

- Disclosing Agents 488 • Precautions When Applying Disclosing Agents 488 • Measure Patient's Oral Hygiene 488 • Biofilm Control Record 489

Oral Hygiene Aids 490

- Biofilm Removal Aids 490 • Stimulators 493 • On-the-Go Aids 495 • Automated Oral Hygiene Devices 497

Fluoride 499

History of Fluoride in Dentistry 500 • Benefits of Fluoride 500 • Mechanism of Action: Systemic versus Topical Fluoride 500 • Patient Assessment 500 • Fluoridation 501 • Fluoride Toxicity 501 • Systemic Fluoride 501 • Topical Fluoride 502

Hygiene Care of Prosthetic Appliances 502

Full and Partial Dentures 502 • Fixed Bridges 503 • Implants 503 • Orthodontic Appliances 504

Challenges to Oral Self-Care 504

The Pregnant Patient 504 • The Infant Patient 504 • The Older Patient 505 • The Patient with Cancer 505 • The Patient with Heart Disease 505 • The Patient with Disabilities 505

Dental Public Health 507

Healthy People 2020 507 • Surgeon General's Report on Oral Health 507 • Government Financing of Dental Care 508 • Community Oral Health Prevention Programs 508

Chapter Summary 508

Case Study 509 • Review Questions 509 • Critical Thinking 510 • Key Terms 511

CHAPTER 17 Nutrition 515**Introduction 515****Health and Nutrition 515****Nutrition and Oral Health 516**

Nutrition and Oral Structures before Birth 516 • Nutrition during Growth and Development of the Mouth 516 • Nutrition for a Lifetime of Oral Health 516

Nutrients 517

Carbohydrates 517 • Proteins 518 • Fats 519 • Vitamins 519 • Minerals 520 • Water 520

Food Groups and Healthy Eating 523

Vegetables Group 523 • Fruits Group 523 • Grains Group 524 • Dairy Group 524 • Protein Group 524 • Oils 524 • Balancing Energy 525 • Nutrition Labels 525

Disease Prevention and Health Promotion 526

Dietary Guidelines for Americans 526 • Reliable Sources of Nutritional Information 527 • Health Monitoring Devices 527 • Energy Drinks and Shots 527

Nutrition and Dental Disease 527

Dental Caries 528 • Periodontal Disease 529

Nutrition and Systemic Effects 530

Malnutrition 530 • Diabetes 530 • Phenylketonuria 531 • Protein Energy Malnutrition 531 • Cancer 531 • Immune System Disorders 531 • Osteoporosis 531 • Physical and Mental Conditions 532

Diet Management for Patients with Special Dental Needs 532

Oral Surgery 532 • Oral Trauma 532 • Orthodontic Treatment 532 • New Dentures 532 • Temporomandibular Joint Disorders 533 • Stomatitis 533

Religious and Cultural Diet Considerations 533**Eating Disorders 533**

Chronic Dieting Syndrome 534 • Bulimia 534 • Anorexia Nervosa 534 • Female Athlete Triad Syndrome 535

Role of the Dental Assistant in Nutrition 535

Diet Assessment Tools 535 • Diet Counseling 536 • Cariogenic Foods Counseling 536

Chapter Summary 537

Case Study 537 • Review Questions 538 • Critical Thinking 539 • Key Terms 539

SECTION V Assist with Diagnosis and Prevention**CHAPTER 18 The Dental Office 543****Introduction 543****Dental Office Design 543**

Reception Area 544 • Business Office 544 • Treatment Room 546 • Sterilization Area 551 • Dental Office Laboratory 551 • Film Processing Area 547 • Radiography Room 548 • Dentist's Private Office 548 • Staff Lounge 548 • Patient Education Area 548 • Consultation Room/Area 548 • Storage Area 549 • Laundry Room 550

Safety Rules in Operating Clinical Dental Equipment 550

Biohazard Safety 550 • Physical Safety 550 • Chemical Safety 551

Clinical Dental Equipment 551

Patient Dental Chair 551 • Dental Stools 554 • Dental Delivery Unit 554 • Dental Unit Equipment 556 • Computerized Equipment 561 • Dental Viewbox 563 • Dental Cabinets 563

Routine Office Care 563

Opening and Closing the Dental Office 564

Receiving and Dismissing**Patients 564**

Prepare the Treatment Area 564 • Prepare Tray Setup 567 • Prepare for Patient Seating 567 • Greet and Seat the Patient 567 • Dismiss the Patient 570

Patients Who May Need Seating Accommodations 574

Small Children 574 • Older Patients 575 • Pregnant Patients 575 • Patients with Sensory Disabilities 575 • Patients with Wheelchairs or Walkers 575 • Non-English-Speaking Patients 575

Chapter Summary 575

Case Study 576 • Review Questions 576 • Critical Thinking 577 • Key Terms 577

CHAPTER 19 Dental Instruments and Tray Systems 579**Introduction 579****Hand Instruments 580**

Parts of Hand Instruments 580 • Identifying Hand Instruments 580

Categories of Hand Instruments 582

Examination Instruments 583 • Hand Cutting Instruments 587 • Restorative Instruments 590 • Accessory Instruments 595

Dental Handpieces 596

Handpiece Power Sources 596 • Handpiece Speed 597 • Handpiece Designs 598 • Parts and Features of Dental Handpieces 599 • Emerging Handpiece Technologies 601

Dental Rotary Instruments 604

Parts of Rotary Instruments 604 • Burs 605 • Abrasive Rotary Instruments 612

Tray Systems 618

Trays and Tubs 618 • Cassette System for Instruments 618 • Prepare for Tray Setup 619 • Color-Coding Systems 621

Chapter Summary 622

Case Study 622 • Review Questions 622 • Critical Thinking 623 • Key Terms 623

CHAPTER 20 Ergonomics and Instrument Transfer 628

Introduction 628

Work-Related Injuries in the Dental Office 628

Lower Back Pain 629 • Upper Back and Shoulders 629
Neck and Shoulders 629 • Wrist and Hands 629
• Stress 631

Ergonomics in Dentistry 632

Body Mechanics 633 • Dental Team Positioning 633
• Motion Economy 634 • Assistant as Operator 634

Instrument Transfer 636

Instrument Transfer Positions 636 • Work Area
Preparation 638 • Instrument Transfer Zones 638
• Instrument Grasps 638

Types of Instrument Transfers 639

Single-Handed Transfer 639 • Double Instrument
Exchange 643 • Two-Handed Transfer 645 • Instrument
Transfer Modifications 647 • Six-Handed Transfer 649

Developing Teamwork 649

Chapter Summary 650

Case Study 650 • Review Questions 650 • Critical
Thinking 651 • Key Terms 652

CHAPTER 21 Moisture Control 654

Introduction 654

Moisture Control Techniques 655

Aspiration Techniques 655

Saliva Ejector 655 • Oral Evacuator (HVE) 656 • HVE
Grasps 656 • HVE Suctioning Guidelines 657 • Position
of HVE 657 • Placement of HVE 657 • Rinse and Dry
Mouth 661

Isolation Techniques 662

Cotton Rolls 663 • Dry Angles 663 • Cotton Pellet 664
• Isolate System 664 • Dental Dam 664

Alternative Methods in Placing the Dental Dam 683

Pharmacological Methods 684

Controlling Excess Salivation 684 • Controlling Excessive
Bleeding 684

Chapter Summary 684

Case Study 685 • Review Questions 685 • Critical
Thinking 686 • Key Terms 686

CHAPTER 22 New Patient Examination 689

Introduction 689

Types of Patient

Examinations 689

Limited/Emergency Oral Examination 689 •
Comprehensive New Patient Examination 690

Components of the New Patient Examination 690

Patient Records 690 • Vital Signs 695 • Dental
Radiographs 698 • Extraoral and Intraoral Soft Tissue
Examination 698 • Examination of the Occlusion
and Oral Habits 699 • Dental Charting 699
• Diagnosis 713 • Treatment Planning 718
• Financial Planning 718

Chapter Summary 718

Case Study 718 • Review Questions 719 • Critical
Thinking 721 • Key Terms 721

CHAPTER 23 Anesthesia and Sedation 723

Pain Management 724

Local Anesthetics 724 • Topical Anesthetics 724
• Noninjectable Anesthesia 725

Dental Local Anesthetics 725

Color Coding of Local Anesthetic Cartridges 726

Injection Techniques 727

Supplemental Anesthetic Techniques 728

Local Anesthetic Reversal Agent 728

Computer Controlled Local Anesthesia 731

Complications of Local Anesthesia Administration 731

Prevention and Management of a Local Anesthesia Related Emergency 731

Armamentarium 733

Armamentarium for Topical and Local Anesthesia 733

Assembling the Anesthetic Syringe 736

Preparing the Aspiring Syringe 736 • Reloading the
Aspiring Syringe 742

Charting Anesthetic Administration 742

Needlestick Safety 742

Postexposure Management 743 • Postexposure
Prophylaxis 743

Sedation 743

Nitrous Oxide Inhalation Sedation 744

Chapter Summary 749

Case Study 749 • Review Questions 749 • Critical
Thinking 751 • Key Terms 751

CHAPTER 24 Oral Prophylaxis and Recare Appointment 752

Introduction 752

Assessment 753

Hard and Soft Deposits 753 • Risk Assessment 754
• Measuring Periodontal Disease 754

Dental Hygiene Diagnosis 756

Planning 758

Implementation 760

Armamentarium 760 • Pain Control 765 • Oral
Prophylaxis 769 • Home Care Instructions 773

Evaluation 773

Documentation 774

Chapter Summary 774

Case Study 774 • Review Questions 774 • Critical
Thinking 776 • Key Terms 776

CHAPTER 25 Coronal Polishing and Topical Fluoride Application 778

Introduction 778

Coronal Polishing 779

Rationale for Coronal Polishing 779 • Contraindications
and Modifications 779

Dental Stains 780

Intrinsic Stains 781 • Extrinsic Stains 781

Types of Coronal Polishing 782

Rubber Cup Polishing 782 • Air-Powder Polishing 790

Ergonomics During Coronal Polishing	793
Topical Fluoride Application	795
Fluoride Tray Application	795
Fluoride Varnish Application	799
Silver Diamine Fluoride	801
Chapter Summary	802
Case Study	802
Review Questions	803
Critical Thinking	804
Key Terms	804

CHAPTER 26 Dental Sealants 806

Introduction	806
Indications for Dental Sealants	806
Contraindications for Dental Sealants	807
Types of Sealant Materials	807
Resin-Based Sealants	807
Glass Ionomer Sealants	811
Enameloplasty Sealant Technique	815
Cause of Sealant Failures	815
Chapter Summary	816
Case Study	817
Review Questions	817
Critical Thinking	818
Key Terms	818

SECTION VI Dental Radiography

CHAPTER 27 Introduction to Dental Radiography, Radiographic Equipment, and Radiation Safety 821

Introduction	822
The History of Radiology	822
Radiation Physics	822
Electromagnetic Energy	823
The Structure of an Atom and Ionization	823
Producing X-Rays	824
Components of the Dental X-Ray Unit	825
Radiation Production	828
Radiation Types	831
Primary Radiation	831
Secondary Radiation	831
Scatter Radiation	831
Leakage Radiation	831
Taking Quality Radiographs	831
Contrast	831
Density	831
Shadow Casting	831
Principle 1	832
Principle 2	832
Principle 3	832
Principle 4	833
Principle 5	833
Distance and the Inverse Square Rule	833
Safety and Precautions	833
Manufacturer's Responsibilities	833
Dentist's Responsibilities	834
Dental Assistant's Responsibilities	834
Patient's Responsibilities	835
Radiation Units of Measurement	835
Biological Effects of Radiation	835
Somatic and Genetic Effects of Radiation	835
Occupational Exposure	836
Intraoral Dental Film	837
Composition of Dental Film	837
Dental Film Speed	837
Dental Film Sizes	838
Dental Film Packet	839
Dental Film Storage	839
Traditional Extraoral Film and Duplicating Film	840
Chapter Summary	840
Case Study	840
Review Questions	841
Critical Thinking	842
Key Terms	842

CHAPTER 28 Dental Radiology Infection Control, Exposure, Processing and Evaluation of Dental Radiographs, and Mounting of Dental Radiographs 843

Introduction	844
Infection Control in Dental Radiographic Procedures	844
Barrier versus Disinfection versus Sterilization	844
Techniques for Exposing Intraoral Radiographs	851
Paralleling Technique	851
Adult Full Mouth Survey of Radiographs	857
Bisecting Technique	858
Bisection of Angle Procedure	872
Comparison of BAT and Paralleling Technique	877
Critique of Radiographs	877
Common Technique Errors	877
Errors during Exposure	879
Occlusal Techniques	880
Localization Techniques	883
Right Angle Technique	883
Tube Shift Technique (SLOB rule)	883
Modified Exposure Techniques	883
Edentulous Patients	883
Tori	884
Pediatric Patients	884
Patients with a Gag Reflex	890
Endodontic Exposures	890
Special Needs Patients/Compromised Patients	890
Radiography Record Keeping	892
Processing Dental Film	892
Developing Process	892
Fixing Process	893
Processing Techniques	893
Automatic Processing	893
Handling Processing Solutions	896
Comparison of Processing Techniques	896
Common Film Processing Errors	896
Film with Light Image	896
Film with Dark Image	896
Fogged Film	897
Partial Image	897
Spotted Films	897
Torn or Scratched Film	898
Air Bubbles on the Film	898
Reticulation	898
Streaks	899
Film Mounts and Film Mounting	899
Mounting Views	899
Viewing of Mounted Radiographs	900
Duplicating Radiographs	902
Chapter Summary	904
Case Study	904
Review Questions	904
Critical Thinking	906
Key Terms	906

CHAPTER 29 Extraoral Radiography, Digital Radiography, and Radiographic Interpretation 907

Introduction	907
Extraoral Radiographs	908
Panoramic Radiography	908
Other Extraoral Images	912
Digital Radiography in the Dental Office	923
The Fundamental Concepts of Digital Radiography	923
Types of Digital Imaging	924
Advantages and Disadvantages of Digital Radiography	926
Three-Dimensional Imaging in Dentistry	929
Hand-held Intraoral Radiography	932
Radiographic Interpretation: Normal Anatomy	932

Radiographic Interpretation: Radiographic Pathologies	935
• Dental Caries	935 • Pulpal and Periapical Lesions
• Radiopaque Lesions	943 • Resorption
• Radiolucent Lesions	944
Periodontal Pathologies Radiographic Interpretation of Periodontal Disease	944
Radiographic Dental Anomalies	945
Radiographic Appearance of Dental Materials	945
Quality Assurance in Dental Radiology	945
X-Ray Machine Tests	945 • Radiographic Film Test
• Screen and Cassette Test	954 • Viewbox Test
• Darkroom Test	955 • Processing Equipment Test
• Dental Radiographic Equipment Test	956
Laws Regulating Dental Radiography	956
Requirements of the Dental Assistant as the Radiographer	957
Responsibilities of the Dental Assistant	957
• Legal Documentation	958
Risk Management	958
HIPAA and Patient Privacy for Radiographs	958
Chapter Summary	958
Case Study	959 • Review Questions
Thinking	960 • Critical Thinking

SECTION VII Assist with Restorative Procedures and Dental Materials

CHAPTER 30 Dental Emergency Procedures and Dental Cements 961

Introduction	961
Dental Emergencies	961
Soft Tissue Emergencies	961
Oral Trauma	962 • Oral Lesions
Injuries	962 • Periodontal Tissue
	963
Hard Tissue Emergencies	966
Hard Tissue Trauma	966 • Progression of Dental
Caries	968 • Loose or Dislodged Restorations
	970
Cavity Preparation	970
Dental Cements	972
Chapter Summary	985
Case Study	986 • Review Questions
Thinking	987 • Key Terms
	987

CHAPTER 31 Amalgam Procedures and Materials 991

Introduction	991
Properties of Dental Materials	991
Acidity	991 • Adhesion
• Corrosion	992 • Biting Forces
• Elasticity	992 • Dimensional Change
• Hardness	993 • Galvanism
• Retention	993 • Microleakage
• Thermal Properties	993 • Solubility
• Wettability	994
	994
Regulations of Dental Materials	994
Preparation for Placement of Dental Amalgam	994
Bases, Liners, and Varnishes	995 • Amalgam
Bonding	1000 • Treatment of Cavity Preparations
	1001

Matrix Systems for Dental Amalgam	1002
Universal Matrix Retainer	1003 • AutoMatrix
• Sectional Matrix Systems	1008 • T-band Matrices
	1008
Dental Amalgam	1008
Composition	1009 • Types of Dental Amalgam
• Forms of Dental Alloy	1010 • Mercury Used in Dental
Amalgam	1010 • Amalgam Properties
• Amalgam Manipulation	1011
Amalgam Restoration	1014
Amalgam Restoration Postoperative Instructions	1014
Finishing and Polishing an Amalgam Restoration	1019
Finishing and Polishing Amalgam Controversy	1020
• Indications for Finishing and Polishing	1020
• Contraindications for Finishing and Polishing	1020
• Differences between Finishing and Polishing	1020
• Finishing and Polishing Procedure	1020
Case Study	1023 • Review Questions
Critical Thinking	1025 • Key Terms
	1025

CHAPTER 32 Composite Procedures and Materials 1028

Introduction	1028
Composite Restorative Materials	1028
Composition of Composites	1028 • Types of Composite
Fillers	1029 • Properties of Composite Restorative
Materials	1029
Preparation for Placement of Composite	1030
Treatment of Cavity Preparation for Composite	1030
Restoration	1030
Matrix Systems for Composites	1035
Matrix Strip	1035 • Crown Matrix Form
	1035
Composite Restoration	1035
Composite Procedures	1038
Types of Direct Esthetic Dental Restorations	1043
Composites	1043 • Glass Ionomer Restorations
• Hybrid (or Resin-Modified) Glass Ionomers	1044
• Compomers	1044
Chapter Summary	1044
Case Study	1045 • Review Questions
Thinking	1046 • Key Terms
	1046

CHAPTER 33 Dental Laboratory Materials 1048

Introduction	1048
Hydrocolloid Impression Materials	1049
Alginate (Irreversible Hydrocolloid) Impression	1049
Material	1049 • Taking Alginate Impressions for
Diagnostic Casts (Study Models)	1052 • Wax Bite
Registration	1052 • Reversible Hydrocolloid Impression
Material (Agar-Agar)	1057
Elastomeric Impression Materials	1059
Polysulfide	1060 • Polyether
(Polysiloxane and Polyvinyl Siloxanes)	1060 • Silicone
	1061
Gypsum Materials	1062
Plaster	1065 • Trimming and Finishing Diagnostic
Cast	1065 • Articulating Casts or Study Models
	1070
Dental Waxes	1074
Wax Groups	1078
Custom Trays	1079
Self-Curing Acrylic Tray Resin Custom Trays	1079 • Light-
Cured Acrylic Tray Resin Custom Trays	1079 • Vacuum-
Formed Custom Trays	1082 • Thermoplastic Tray Material
Custom Trays	1083 • Constructing a Custom Tray
	1083

Temporary (Provisional) Restorations 1086

Types of Temporary Restorations 1086

Chapter Summary 1099Case Study 1099 • Review Questions 1099
• Critical Thinking 1100 • Key Terms 1100**SECTION VIII Assist with Comprehensive Patient Care****CHAPTER 34 Pediatric Dentistry 1103****Introduction 1103****The Pediatric Office 1104**The Concept of a Dental Home 1104 • The Pediatric Dental Team 1104 • The Pediatric Patient 1105
• The Pediatric Dental Assistant 1105 • Child Abuse and Dental Neglect 1106**Etiology of Dental Caries 1106**

Early Childhood Caries 1106

Infant Oral Exam 1106

Pediatric Charting 1106 • Charting Present and Missing Teeth 1107 • Charting Pediatric Conditions and Abnormalities 1107

Prevention 1107

Oral Hygiene Instructions 1108 • Dietary Guidelines 1108 • Fluoride Application 1108 • Dental Sealants 1109 • Regular Checkups 1109

Behavior Management 1109Communication 1109 • Pharmacological Behavior Management 1110
Conscious Sedation 1111**Pediatric Restorative Procedures 1111**Pediatric Instruments and Equipment 1111 • Anesthetic Syringe Pass 1113 • Dental Dam 1113 • Preventive Resin Restoration 1114 • Pediatric Crowns 1114
• Anterior Esthetic Crowns 1117**Pediatric Pulp Treatment 1117**

Pulpotomy Procedure 1117 • Pulpectomy Procedure 1117

Pediatric Orthodontic Treatment 1120

Preventive Orthodontic Treatment 1120 • Interceptive Orthodontics 1121

Pediatric Emergency Treatment 1122Primary Teeth Traumatic Injury 1122 • Primary Teeth Displacement Trauma 1122 • Effects on Permanent Tooth 1123 • Fractured Anterior Primary or Permanent Teeth 1123 • Orofacial Soft Tissue Trauma 1123
• Prevention of Orofacial Injury 1124**Chapter Summary 1125**

Case Study 1125 • Review Questions 1125 • Critical Thinking 1126 • Key Terms 1127

CHAPTER 35 Orthodontics 1130**Introduction 1130****Focus of Orthodontic Treatment 1130****The Orthodontic Team 1131**

Orthodontist 1131 • Orthodontic Scheduling Coordinator 1131 • Orthodontic Treatment and Financial Coordinator 1131 • Orthodontic Records Coordinator 1132 • Orthodontic Chairside Assistants or Certified Orthodontic Assistant (COA) 1132 • Infection Control Coordinator 1132

Orthodontic New Patient Exam 1132Patient Information 1132 • Medical and Dental History 1132 • Chief Complaint 1133 • Panoramic Evaluation 1133 • Facial Exam and Profile Assessment 1134 • TMJ and Functional Evaluation 1134
• Teeth and Gingiva 1134**Evaluation of Occlusion and Skeletal Patterns 1135**Anterior–Posterior Plane of Occlusion and Related Skeletal Patterns 1136 • Transverse Plane of Occlusion 1139
• Vertical Plane of Occlusion and Related Skeletal Patterns 1142 • Perimeter Plane 1143**New Patient Exam Summary 1147****Orthodontic Diagnostic Records and Analysis 1147**Clinical Photographs 1147 • Study Models or Digital Intraoral Scans of the Teeth and Analysis 1147
• Cephalometric Radiographs and Analysis 1148
• Panoramic Evaluation and Periapical Radiographs 1148
• Cone Beam/CAT Scan/3D Radiography 1149
Periodontal Exam 1149 • Supplemental Diagnostic Records 1150 • Mounted Diagnostic Study Models and a Diagnostic Setup or Digital Diagnostic Planning 1150**Process of Diagnosis and Treatment Planning 1150**The Problem List 1150 • Objectives of Treatment 1150
• Potential Treatment 1151 • Treatment Options 1151**Orthodontic Treatment Consultation 1151****Orthodontic Treatment of Young Children 1151**Observation and Counseling 1151 • Interceptive 1151
• Phase I Early Treatment with Limited Braces, Growth Appliances, Expansion, and Extractions 1152**Orthodontic Treatment of Adolescents 1153**Observation and Counseling 1153 • Phase II Treatment (Comprehensive Orthodontic Treatment) of Adolescents Following Phase I 1154 • Comprehensive Orthodontic Treatment of Adolescents with Growth Appliances 1154
• Comprehensive Orthodontic Treatment of Adolescents Combined with Multidisciplinary Care 1155 • Clear Aligner Therapy for Adolescents 1157**Orthodontic Treatment of Adults 1157**Comprehensive Orthodontic Treatment Combined with Multidisciplinary Treatment 1157 • Comprehensive Orthodontic Treatment with Orthognathic Surgery 1157
• Clear Aligner Therapy 1157**Orthodontic Retention 1158****Appointments for Comprehensive Orthodontic Treatment with Braces 1158**Orthodontic Separators 1159 • Fitting and Cementing Orthodontic Bands 1159 • Orthodontic Bonding of Brackets to the Teeth 1161 • Orthodontic Wires Used in the Five Phases of Orthodontic Treatment 1161
• Insertion of the First Orthodontic Wire 1163
• Orthodontic Retie Adjustment Appointment 1165
• Orthodontic Debanding/Debonding Appointment for Removal of the Braces 1166**Chapter Summary 1181**

Case Study 1182 • Review Questions 1182 • Critical Thinking 1183 • Key Terms 1183

CHAPTER 36 Oral and Maxillofacial Surgery 1186**Introduction 1186****The Oral and Maxillofacial Surgery Team 1186**Oral and Maxillofacial Surgeon 1186 • Receptionist and Business Staff 1187 • Surgical Dental Assistant 1187
• Nurse Anesthetist or Anesthesiologist 1187**Consultation Appointment 1187**Oral Surgery Settings 1188 • Informed Consent 1188
• Preoperative Instructions 1189

Methods to Control Pain and Anxiety 1190

Local Anesthesia 1190 • Sedation 1190 • General Anesthesia 1190 • Nitrous Oxide 1190

Oral Surgery Procedures 1191

Surgical Asepsis 1191 • Routine Extractions 1191 • Multiple Extractions 1198 • Extraction of Impacted Teeth 1206 • Biopsy 1209 • Cleft Lip and Palate Surgery 1209 • Temporomandibular Joint Disorder 1209 • Orofacial Trauma Patients 1209 • Orthognathic Surgery 1210

Postoperative Procedures 1210

Suture Removal 1211 • Postoperative Complications 1212

Chapter Summary 1214

Case Study 1215 • Review Questions 1215 • Critical Thinking 1216 • Key Terms 1216

CHAPTER 37 Endodontics 1218**Introduction 1218****Pulp Tissue Anatomy 1218****Progression of Pulpal Disease 1219**

Reversible Pulpitis 1219 • Irreversible Pulpitis 1219 • Asymptomatic Irreversible Pulpitis 1220 • Necrotic Pulp 1220

Periapical (Periradicular) Involvement 1220

Apical Periodontitis 1220 • Periapical (Periradicular) Abscess 1220 • Periapical Granuloma 1221 • Periapical Neoplasm 1221 • Osteomyelitis 1221 • Cellulitis 1221

Pulpal Disease Diagnosis 1221

Medical and Dental History 1221 • Clinical Examination 1222 • Radiographic Survey 1222 • Diagnostic Tests 1222 • Treatment Plan 1225

Classification of Endodontic Treatment 1225

Nonsurgical Endodontic Procedures 1225 • Pulp Capping 1225 • Surgical Endodontic Procedures 1241

Chapter Summary 1243

Case Study 1243 • Review Questions 1243 • Critical Thinking 1245 • Key Terms 1245

CHAPTER 38 Periodontics 1249**Introduction 1249**

Periodontal Disease 1250 • Causes of Periodontal Disease 1250 • Progression of Periodontal Disease 1251 • Classifications of Periodontal Disease 1251

Periodontal Examination 1252

Medical and Dental History 1252 • Clinical Examination 1253 • Periodontal Examination 1253 • Presentation of Treatment Plan 1257

Periodontal Instruments 1257

Instrument Sharpening 1257 • Periodontal Probes 1258 • Explorers 1258 • Curettes 1258 • Scalers 1258 • Files 1259 • Ultrasonic Instruments 1259 • Air Polishing Systems 1260 • Periodontal Knives 1261 • Interdental Knives 1261 • Periotomes 1261 • Surgical Scalpel 1261 • Electrosurgery 1261 • Pocket Marking Pliers 1261 • Periosteal Elevators 1261 • Periodontal Scissors, Rongeurs, and Forceps 1261 • Lasers 1261

Nonsurgical Periodontal Procedures 1264

Occlusal Adjustment 1264 • Root Planing 1265 • Gingival Curettage 1266

Adjunctive Therapies 1266

Oral Irrigation 1266 • Systemic Antibiotic Therapy 1266 • Locally Applied Drug Delivery 1267 • Peridex® 1267 • Enzyme Suppression Therapy 1267 • Precautions/Contraindications 1267

Healing 1267**Surgical Periodontal Procedures 1267**

Preoperative Instructions 1268 • Gingivectomy 1268 • Gingivoplasty 1268 • Periodontal Flap Surgery 1268 • Osseous Surgery 1269 • Bone Grafting 1269 • Mucogingival Surgery 1270 • Crown Lengthening Procedure 1270

Periodontal Dressings and Sutures 1270

Types of Periodontal Dressings 1271 • Patient Healing 1271

Periodontal Maintenance 1272**The Role of the Dental Assistant 1273****Chapter Summary 1281**

Case Study 1281 • Review Questions 1281 • Critical Thinking 1282 • Key Terms 1282

CHAPTER 39 Dental Implants 1283**Introduction 1283****Advantages of Dental Implants 1283****Disadvantages of Implants 1284****Dental Implant Success Rate 1284****Parts of an Implant 1285**

Implant Body or Fixture 1285 • Abutment 1285 • Healing Screw and Healing Cap 1285 • Dental Implant Connectors 1286

Considerations for Dental Implants 1286

Crown/Bridge 1286 • Contraindications for the Placement of Implants 1286 • Patient Selection for Implantation 1287

Patient Preparation 1288

Treatment Sequence 1288

Types of Implants 1290

Subperiosteal Implants 1290 • Endosteal Implant 1290 • Mini Dental Implants 1290 • Transosteal Implant 1292

Immediate Load Dental Implants 1292**Surgical Techniques for Implant Placement 1293**

Single Surgery Technique 1293 • Two Surgery Technique 1293

Postoperative Care and Home Care Instructions 1293

Dental Implant Maintenance 1294

Implant Retained Prostheses 1298**Role of the Dental Assistant 1298**

Implant Coordinator 1299 • Implant Supply Company Representative 1299

Chapter Summary 1300

Case Study 1300 • Review Questions 1300 • Critical Thinking 1302

CHAPTER 40 Fixed Prosthodontics 1303**Fixed Prosthodontics 1303**

The Objectives of Fixed Prosthodontics 1304 • Types of Fixed Prosthodontics 1304

Patient Factors 1309**Preparation Appointment 1309**

Occlusal Exam 1309 • Radiographs 1309 • Preliminary Impression and Study Casts 1310 • Selecting a Shade 1310 • Case Presentation 1311

First Treatment Appointment 1311

Anesthetic Application 1312 • Tooth Preparation 1312 • Final Impression and Bite Registration 1314 • Provisional Coverage 1315

Communicating with the Dental Laboratory 1316

Communication Tools 1316 • Digital
Communication 1317

Second Treatment Appointment 1318

Removal of Provisional Restoration 1318 • Cementation
of Final Restoration 1318

Concerns Regarding Fixed Dental Prosthesis 1328

Oral Hygiene 1328 • Structural Stresses on a Fixed
Appliance 1329 • Dental Sensitivity Related to Fixed
Dental Prosthesis 1329 • Xerostomia and Sjogren's
Syndrome 1330 • Replacement of an Existing Fixed
Dental Prosthesis 1330

Changing Trends 1330**Informed Consent 1330****Documentation of Fixed Prosthodontic
Treatment 1331**

Charting Fixed Prosthodontics 1331 • Documenting
Patient Instructions 1331

Chapter Summary 1333

Case Study 1333 • Review Questions 1333 • Critical
Thinking 1335 • Key Terms 1336

**CHAPTER 41 Computerized Impression and
Restorative Systems 1337****Introduction 1337****CAD/CAM 1337****Digital Impression Systems 1339**

Soft Tissue Management 1341

The Role of the Dental Assistant 1341

Patient Considerations 1341

Chapter Summary 1343

Case Study 1344 • Review Questions 1344 •
Critical Thinking 1345 • Key Terms 1345

CHAPTER 42 Removable Prosthodontics 1346**Introduction 1346**

Objectives of Removable Prosthodontic Treatment 1347

Types of Partial Dentures 1347

Transitional Partial Denture 1347 • Cast Partial 1347

Kennedy Classification of Edentulous Arches 1348**Types of Full Dentures 1349**

Immediate Denture 1349 • Overdentures 1350

Removable Partial Dentures 1350

Components of a Removable Partial Denture 1350
• Indications and Contraindications for Removable
Partial Dentures 1353 • Advantages of Removable
Partial Dentures 1353 • Disadvantages of Removable
Partial Dentures 1354 • Appointments and Procedures
for a Removable Partial Denture 1354 • Role of the Dental
Assistant in Removable Partial Denture Procedures 1357

Full Dentures 1358

Surfaces of the Full Denture 1358 • Components
of a Full Denture 1359 • Advantages 1360 •
Disadvantages 1360 • Appointments and Procedures
for Full Dentures 1361 • Role of the Dental Assistant in
Full Denture Procedures 1363

Healthy Oral Environment 1363

Xerostomic Denture Wearers 1363 • Denture Sore
Spots 1364 • Denture Adhesives 1364 • Denture
Relining 1364 • Denture Rebasing 1365 • Denture
Repair 1365 • Denture Cleaners 1365

Charting for Removable Prosthodontics 1366

Charting Abbreviations 1366

Chapter Summary 1379

Case Study 1380 • Review Questions 1380 • Critical
Thinking 1381 • Key Terms 1381

**CHAPTER 43 Cosmetic Dentistry and Teeth
Whitening 1382****Introduction 1382****Cosmetic Dental Team 1382****Procedures in Cosmetic Dentistry 1383****Tooth Whitening 1383**

How Teeth Are Whitened 1384 • Indications for Dental
Whitening 1384 • Whitening Techniques 1384

Cosmetic Prosthodontics 1390

Fixed Prosthodontics 1390 • Removable
Prosthodontics 1390

Occlusion in Cosmetic Dentistry 1391**Contouring Soft Tissues in Cosmetic Dentistry 1391**

Soft Tissue Contouring 1391 • Surgical Lip
Repositioning 1392 • Tissue Grafting 1393

Chapter Summary 1393

Case Study 1393 • Review Questions 1393 • Critical
Thinking 1394

**SECTION IX Dental Practice
Management****CHAPTER 44 Dental Practice
Management 1395****Introduction 1395****Welcome Letter 1396**

Format 1396

Marketing a Dental Practice 1396

Online Marketing 1397

Reception Area 1399**Front Office Staff 1399****Telephone Technique 1400**

Basic Telephone Techniques 1400 • Answering
Calls 1400 • Placing Callers on Hold 1400 • Taking
Messages 1401
Outgoing Calls 1401
English as a Second Language 1401

Communication Technology 1402

Answering Machine 1402
Answering with Headphones 1403
Answering Services 1403 • Voicemail 1403
Fax Machines 1403 • Email 1404
Cell Phones 1404
U.S. Postal Service 1404

Patient Care Plan 1405

Presenting the Care Plan 1405

Appointment Scheduling 1405

Appointment Scheduling Guidelines 1405 • Elements in
Appointment Scheduling 1407 • Scheduling of Dental
Hygiene 1407 • Scheduling of New Patients 1407
• Scheduling of an Emergency 1408 • Scheduling
Appointments for Children 1408 • Scheduling Multiple
Appointments 1408 • Scheduling Appointments for

the Expanded-Function Practice 1408 • Appointment Card 1408 • Scheduling for Production 1408 • Confirmation of Appointments 1409 • Conditions Affecting Patient Scheduling 1409 • Call Lists 1410 • Other Scheduling Concerns 1410

Recare Systems 1410
Computerized Recare System 1410 • Chronological Card File 1412 • Color-Tagged Card File 1412

Business Office Systems 1412
Word Processing 1412 • Graphics 1412 • Spreadsheets 1413 • Dental Office Software 1413 • Employee Records 1414 • Inventory Management 1414 • Ordering Supplies 1416 • Computer Safety 1417

Dental Records Management 1418
Equipment and Supplies for Record Management 1418 • Patient Chart Filing 1418 • Record Confidentiality 1419 • Archival Storage 1420 • Electronic Record Keeping 1420 • Paperless Dental Practice 1420

Managing Office Finances 1420
Patient Account Management 1420 • Accounts Receivable 1421 • Bank Deposits 1424 • Monthly Billing 1426 • Accounts Payable 1428

Dental Insurance 1431
What Is Dental Insurance? 1431 • Parties Involved in Insurance 1432 • Managing Insurance Benefits 1432 • Insurance Fraud 1434

Dental Benefit Programs 1437
Indemnity Plans 1437
Capitation 1437
Alternative Benefits 1437 • Medicaid 1439

Staying Current 1440
Teledentistry 1440 • Connecting with the Office through Mobile Devices 1440 • Web Conferencing 1440 • Distance Learning 1440

Chapter Summary 1441
Case Study 1441 • Review Questions 1441
• Key Terms 1442

CHAPTER 45 Career Planning 1447

Introduction 1447

Know Your State Requirements 1448

A Job Search Plan 1448

Establishing Career Objectives 1448 • Creating a Portfolio 1448 • Employment Opportunities 1456 • Employment Search 1458 • Searching for the Right Position 1458

Arranging an Interview 1458

Job Application 1459 • Pre-Interview 1463

The Interview 1463

Research Dental Office 1463 • Visit Location 1463 • Develop Talking Points 1463 • Have Questions Ready 1464 • Practice Interview 1464 • Interview Dress 1466 • Follow Up Letter 1466 • Second Interview 1466 • Accepting the Job 1467 • Turning Down an Offer 1468

Job Orientation 1468

Keeping Your Job 1468

Attitude 1469 • Attendance 1469 • Appearance 1469 • Dependability 1470 • Patient Care 1470 • Competence 1470 • Team Player 1470 • Honesty and Respect 1471

Losing Your Job 1471

Being Placed on Probation 1471 • Saving Your Job 1471 • Leaving a Job 1472 • Being Fired 1472

Advancing in Your Job 1472

Professional Development 1472

Plethora of Learning Opportunities 1474

American Dental Assistants Association 1474 • DANB Professional Certification 1474 • DALE 1475

Professional Development Plan 1475

Continued Success 1475

Chapter Summary 1475

Case Study 1476 • Review Questions 1476 • Critical Thinking 1477

NEW TO THIS EDITION

General Updates

- Key Terms feature has been updated throughout the text to include phonetic pronunciation, the meaning of root and word parts, and the definition for each key term
- Dental operator steps were added to each step-by-step procedure, as applicable
- New images have been added throughout the text, including new step-by-step procedure photos, to enhance the topics discussed

Chapter 2

- Added/expanded discussion of:
 - Several health behavior theories in addition to Maslow's and how each can be utilized to improve the oral health of the patient
 - Characteristics of children, older adults, and Generation Alpha
 - Preparing dental presentations
- Expanded on the topic of written communication to include office letters and other forms of written communication, including electronic communication

Chapter 3

- Added/expanded discussion of:
 - Ethical principles
 - Ethical dilemmas
 - The differences between criminal law and tort law
 - Regulatory and nonregulatory agencies involved in dentistry
 - HIPAA responsibilities in various areas of dentistry, including technology
- Added image of a sample patient consent
- Added image of a sample acknowledgement of HIPAA policy
- Moved CDT codes to Chapter 44

Chapter 4

- Formerly Chapter 6
- Added/expanded discussion of:
 - Information on the cell and organization of the human body
 - The urinary system
 - The brain
 - The interrelationship between oral health and the various systems
- Added anatomical images including on the cell

Chapter 5

- Removed the section "Landmarks of the Face and Oral Cavity" and moved it to a new Chapter 6
- Added a new table that includes descriptions of all the cranial nerves

- Added several tables to provide concise information about nerves, arteries and veins, as well as their branches that supply the head and neck

Chapter 6

- This is a newly added chapter
- Added/expanded discussion of:
 - Regions of the face
 - Healthy and unhealthy gingiva

Chapter 7

- Reduced the Stages of Pregnancy topic/content
- Added histological images of tooth development
- Added several images to enhance the topics discussed in the chapter

Chapter 8

- Formerly Chapter 9
- Added/expanded discussion of:
 - Tooth landmarks from each aspect
 - Tooth characteristics and distinguishing features to assist in identifying teeth
 - Primary and permanent teeth
 - Universal Numbering System
- Added color images of tooth landmarks from each aspect

Chapter 9

- Moved chapter from Dental Specialties section to Dental Sciences section
- Added/expanded discussion of:
 - Tools available for oral cancer detection
 - Educating patients to perform an oral cancer screening on themselves
- Added tables that provide standard terms used to describe lesions
- Moved dental caries topic to this chapter and added detailed information in a table format regarding stages of decay
- Added step-by-step procedure for performing an intraoral and extraoral exam

Chapter 11

- Added/expanded discussion of:
 - Covid-related infection control procedures
 - Different surfaces in the dental office, with new images
 - Sanitizing surfaces, with new images
 - The Bloodborne Pathogens Standard and Hazard Communication Standard
- Additional images added for procedure related to handwashing

- Added new step-by-step procedures for:
 - Alcohol-based hand hygiene
 - Surgical hand scrub
 - Donning surgical gloves
 - Operating an ultrasonic cleaner
 - Operating an autoclave
- Expanded procedure related to treating a contaminated tray, with new images

Chapter 14

- Added/expanded discussion of:
 - Importance of knowing about drugs and how drugs are tested
 - Drug names
 - Routes of administration
 - Administration, distribution, metabolism, and excretion
 - Substance use disorder, including preventing drug diversion, identifying the patient with a substance use disorder, and medications used to treat substance use disorders
 - Adverse drug reactions
 - Commonly used drugs administered in a dental office or prescribed by a dentist
 - 2007 American Heart Association (AHA) guidelines for prophylactic antibiotics
 - American Society of Anesthesiologists (ASA) Classification of Risk Assessment
- Added new figures to include expanded information related to common abbreviations
- Added new tables detailing conversions for prescriptions, potential teratogenic effects of drugs, dental local anesthetics available for use in the United States, comparisons of over-the-counter analgesic medications, and comparisons of prescription pain medications
- Removed content related to caffeine, herbal and alternative medications

Chapter 15

- Added/expanded discussion of:
 - The importance of the medical history in preventing a medical emergency
 - The importance of vital signs
 - The most recent AHA blood pressure classifications and dental management protocol
 - Identification and management of the apprehensive patient
 - Stress reduction protocol
 - American Society of Anesthesiologist (ASA) classification
 - Medical consultation
 - The emergency kit

- Each emergency that may occur in a dental office including prevention, management, medical history questions, predisposing factors, signs and symptoms, and ASA classifications

- Added new step-by-step procedures for:
 - Taking blood pressure
 - Obtaining pulse and respiration
- Added a sample medical history form
- Added a sample medical consultation
- Added tables that describe the drugs in the emergency kit along with images of drugs
- Categorized emergencies into syncope, respiratory disorders, adrenal disorders, thyroid disorders, diabetes, angina and MI, congestive heart failure, seizures, cerebrovascular accident, allergies, and airway obstruction
- Added several images to enhance the topics discussed in the chapter
- Moved discussion of dental emergencies to a separate chapter
- Removed CPR/BLS section

Chapter 23

- Added/expanded discussion of:
 - Noninjectable anesthetics
 - Complications related to local anesthesia
 - Postexposure management
- Added tables that provide coverage of:
 - Short, intermediate, and long-acting local anesthetics
 - Injection name, area anesthetized, needle insertion site, length and gauge of needle used, and depth of insertion
 - Prevention of dental local anesthetic related emergencies
 - Systemic adverse reactions of dental local anesthetics

Chapter 24

- This is a new Chapter highlighting preventative dental treatment
- Includes three new step-by-step procedures relating to preventative care: periodontal charting, oral prophylaxis, and scaling and root planning
- Formatted to focus on the ADHA standards for clinical dental hygiene practice

Chapter 25

- Added/expanded discussion of:
 - Silver Diamine Fluoride
 - Ergonomics during preventative care
 - Air-powder polishing
 - Stain
- Added a step-by-step procedure on air-powder polishing

Chapter 27

- Added/expanded discussion of:
 - Direct and indirect damage by an x-ray photon, including images
 - Shadow casting and the principles of shadow casting
 - Inverse square law
 - Linear nonthreshold curve, including image
- Added description and table with images of types of interactions with radiation
- Added table with information related to radioresistant and radiosensitive cells
- Included use of term “image receptor” to be inclusive of films and digital sensors unless specifically referring to traditional film

Chapter 28

- Updated the title for this chapter
- Added/expanded discussion of:
 - Infection control as it specifically relates to dental radiology equipment, digital systems, image receptors, supplies and processing for traditional films
 - Infection control before, during, and after exposures
 - Standard exposure sequence for paralleling and bisecting techniques
 - Anatomical landmarks to be used for bisecting technique
 - Object localization using SLOB rule and the right angle technique
- Included use of term “image receptor” to be inclusive of films and digital sensors unless specifically referring to traditional film
- Moved digital imaging from Chapter 23 to this chapter
- Added table and diagrams that specify maxillary and mandibular entry points for primary beam when using the bisecting technique
- Added step-by-step procedure for bisecting the angle technique

Chapter 29

- Updated the title for this chapter
- Added/expanded discussion of:
 - The coronal, axial and sagittal views of 3D imaging
 - Radiographic appearance of decay, with images
 - Radiographic pulpal and periapical lesions, with images
 - Radiographic appearance of periodontal disease, with images
 - Radiographic appearance of dental anomalies, with images
 - Radiographic appearance of dental materials, with images
- Added direct and indirect digital panoramic options to the panoramic exposure procedure

- Added tables that summarize radiopaque and radiolucent maxillary landmarks and radiopaque and radiolucent mandibular landmarks

Chapter 33

- Updated step-by-step procedures to include automix cartridges with extruder guns
- Due to the eradication of polysulfide impressions, this step-by-step procedure was updated with taking a polyether impression

Chapter 38

- Added/expanded discussion of:
 - The classifications of periodontal disease based on the most recent American Academy of Periodontology guidelines
 - Periodontal risk assessment
 - Adjunctive periodontal therapies
 - Peridex®
- Added tables that cover:
 - The risk factors for periodontal disease
 - Glickman’s classification of furcation involvement
 - Healthy gingiva and changes that take place related to periodontal disease
 - Locally applied antimicrobial agents

Chapter 39

- Added/expanded discussion of:
 - Indications and contraindications to dental implants
 - Patient selection for dental implants
 - The role of the implant coordinator

Chapter 40

- Added/expanded discussion of:
 - Clinical considerations for bridges
 - Shade selection
 - Digital communication
- Added table covering symbols and abbreviations used in fixed prosthodontics
- Added image of digital patient charting with fixed prosthodontic procedures

Chapter 41

- Added discussion on advantages and disadvantages of CAD/CAM technology

Chapter 42

- Added/expanded discussion of:
 - Transitional partial dentures as a type of partial denture
 - Nesbit partial denture as a type of partial denture
 - Kennedy classification for edentulous arches, with image

- Patient instructions for care of partial dentures
- Surfaces of a full denture
- Post palatal seal of a maxillary denture
- Xerostomia and impact on dentures
- Denture adhesives
- Denture sore spots
- Added image of an electronic patient charting record with removable procedures charted
- Added table covering abbreviations and symbols used in removable prosthodontics

Chapter 44

- Reorganized the chapter content for a better learning experience
- Added/expanded discussion of:
 - Language barriers
 - Teledentistry visits
 - CDT codes

PREFACE

The world of health care changes rapidly. The twenty-first century presents health care professionals with more challenges than ever before—but with challenge comes opportunity. Job prospects for dental assistants have never been better. The Bureau of Labor Statistics expects employment in our field to grow faster than the average for all occupations through the year 2030. Population growth, an increase in the aging population, and greater retention of natural teeth will fuel demands for dental services. As the health care industry requires more services to be completed by dentists, the dental assistant will be more valuable and needed than ever before. Many states are passing legislation allowing for an expansion in the skills that dental assistants can provide—with additional training. Placing restorations, obtaining virtual impressions, and monitoring general sedation are a few examples. As a dental assistant, you'll be expected to take on an increasing number of clinical and administrative responsibilities to stay competitive. Now is the time to equip yourselves with the range of skills and competencies you'll need to excel in the field. Now is the time to maximize your potential, to expand your base of knowledge, and to dedicate yourself to becoming the multifaceted dental assistant required in the twenty-first century. This text and complete learning system, *Dental Assisting: A Comprehensive Approach*, sixth edition, will guide you as a dental assisting student on this journey. The result of years of research, writing, and testing, this system is designed to prepare you for the Dental Assisting National Board (DANB) certification examination, some state credentialing, and the workplace. It presents information in a unique manner, using a variety of formats that account for the diverse ways in which today's students learn. To receive the full value of *Dental Assisting: A Comprehensive Approach*, sixth edition, it is important to understand the structure of the text, chapters, MindTap, and accompanying workbook as well as other supplements, and how they are all integrated into a complete learning system. Together, these materials will make your dental assisting education comprehensive and meaningful, providing you with the skills, knowledge, principles, values, and understanding needed to excel in your chosen profession.

Why We Wrote This Book Three dental educators, Vaishali Singhal, Susan Kantz, and Melissa Damatta, are the lead authors who developed the sixth edition of this textbook. Additionally, the book includes a team of contributing authors that includes notable educators and practitioners with expertise and national involvement in all phases and levels of dental assisting. We developed this edition according to the Commission on Dental Accreditation (CODA) Standards for Dental Assisting as well as the American Dental Association (ADA) content areas. The expansive table of contents for this textbook addresses some of the problems we identified with other dental assisting textbooks currently on the market; for example, educators have complained, “we were still fervently shopping for supplemental texts and media to improve our programs; most available videos were outdated and expensive, and often did not match the text; the

chapters of the existing texts were extremely large and were often not in a sequence suitable for our programs; and as a result the texts inhibited the flexibility of instruction.” Thus, the goal of this text is to provide all inclusive text and supporting materials for dental assisting program instructors—to provide a comprehensive educational program rather than simply a text. This comprehensive program is structured to provide built-in flexibility to support the individual academic freedom of faculty. The chapters are ordered to allow for performance-based sequencing of procedures arranged from basic to complex and from general to specialty practice.

The Learning System

The components of the learning system were developed with today's learner in mind. The authors and Cengage recognize that students learn in different ways—they read, write, listen, watch, interact, and practice. For this reason, we've created a variety of products learners can use to fully comprehend and retain what they are taught. An instructor's manual ties the components together, making classroom integration easy and fun.

• The Text

This text delivers comprehensive coverage of dental assisting theory and practice, supported by full-color illustrations and photographs throughout with 169 step-by-step procedures in nine sections. Section I, *Dentistry as a Profession*, introduces learners to the profession and its history as well as communication and legal issues. Section II, *Dental Sciences*, covers the basics of general anatomy, head and neck anatomy, embryology, histology, tooth anatomy, and oral pathology, creating a foundation on which learners can move forward in skills training. Section III, *Preclinical Dental Sciences*, covers microbiology and infection control in dentistry, managing hazardous materials that may be found in a dental office, managing patients who are medically compromised or have special needs, preventing and managing common medical emergencies that may occur in a dental office, and pharmacology, all of which are critical elements to the profession. This textbook contains the latest and most up-to-date infection control protocol related to the recent COVID-19 pandemic. Section IV, *Prevention and Nutrition*, discusses general techniques to maintain health and wellness of the oral cavity and the dentition. Section V, *Assist with Diagnosis and Prevention*, introduces the learner to the dental office and equipment, chairside assisting, instruments, management of pain and anxiety, and preventive techniques in dentistry. This section also includes information on advanced functions such as coronal polish and dental sealants. Section VI, *Dental Radiography*, provides updated information on radiographic techniques and procedures, including the latest on digital and three-dimensional radiography. Section VII, *Assist with Restorative Procedures and Dental Materials*, introduces

the learner to commonly used dental materials, assisting in procedures related to amalgam, dental cements, and composite as well as the management of dental emergencies. Section VIII, *Assist with Comprehensive Patient Care*, introduces learners to the specialized areas of dentistry and the importance of comprehensive care, as well as advanced skills of retraction cord placement and tooth whitening. Section IX, *Dental Practice Management*, contains coverage of dental office management, dental computer software, dental insurance, employment portfolios, and legal and ethical considerations, which are important components for managing a dental practice properly. New features such as patient dialogues and professional encounters have been added to the sixth edition. The professional encounter feature provides real-life scenarios regarding communication with a patient, offering the learner professional experiences of those in the field. Each chapter includes the following pedagogical features as applicable:

- Specific instructional objectives
- New feature: Comprehensive approach to building medical and dental terminology using root words along with key terms
- Introduction
- Step-by-step procedures with icons indicating handwashing, gloves, masks, protective clothing and protective eyewear, basic setup, and expanded functions (see icons below)
- In-text icons identifying legal and safety areas (see icons below)
- Boxed information containing tips and summaries
- New feature: Special features in online Instructor Manual that include documentation, patient dialogue, and professional encounters
- Chapter summary
- Case studies
- Review questions, including critical thinking questions
- New feature: Most up-to-date infection control protocol related to the COVID-19 pandemic



HANDWASHING



GLOVES



LEGAL

MASK AND PROTECTIVE
EYEWEAR

CLOTHING



SAFETY

● MindTap

It's 1 A.M. There are 20 tabs open on your computer. You lost your flashcards for the test, and you're so tired you can't even read. It would be nice if someone came up with a more efficient way of studying. Luckily, someone did. With a single login for MindTap® for *Dental Assisting: A Comprehensive Approach*, sixth edition, you can connect with your instructor, organize coursework, and have access to a range of study tools, including the ebook and apps, all in one place!

- **Manage your time and workload without the hassle of heavy books!** The MindTap Reader keeps all your notes together, lets you print the material, and will even read text out loud.
- **Want to know where you stand?** Use the Progress app to track your performance in relation to other students.
- **Engage with the material.** Videos and animations help your understanding of key concepts while simulations and quizzing help you bridge the gap from learning to real-world application.
- The **MindTap eReader** takes the textbook experience to a whole new level with the ability to have the material read to you with **Readspeaker**, print the material and take it with you for on-the-go preparation, and take notes or highlights within the eReader, which feeds to the StudyHub App for easy study guide creation.
- The **New MindTap Mobile App** not only includes access to the e-book both online and offline, but keeps you connected to your instructor and your course with alerts and notifications. It also arms you with on-the-go study tools like flashcards and quizzing, helping you to manage your limited time efficiently.
- **Flashcards** are prepopulated to provide a jump-start on your course preparation and studying. You can also create your own customized cards as you move through the course material, with the ability to go directly to definitions by clicking on colored key terms within the text.

● Instructor Resources

Additional instructor resources for this product are available online. Instructor assets include an Instructor's Manual, Educator's Guide, PowerPoint® slides, and a test bank powered by Cengage®. Sign up or sign in at www.cengage.com to search for and access this product and its online resources.

Components available on the Instructor Resource Center include:

- A computerized test bank, with questions geared to text chapters and mapped to CODA accreditation standards; available for download in many different LMS options
- Instructor presentations on PowerPoint™ with talking points, designed to support and facilitate classroom instruction
- An electronic version of the *Instructor's Manual* so that notes and ideas can be customized
- assisting materials to create a dynamic learning system

- A transition guide to help make a smooth transition from the fifth to the sixth edition
- Skill checklists to use for student evaluation.
- Resources guide containing books, articles, and useful links, sorted by chapter.

● Student Workbook

The workbook, which corresponds to the text, contains chapter objectives and exercises in a variety of formats. Each workbook chapter was standardized to include a variety of activities such as matching, true/false, fill in the blank, multiple choice, certification review, critical thinking questions, and case studies to allow each student to learn the concepts in a manner that is best suited to their individual learning style. The questions are mapped to the objectives, providing a holistic exposure to the content of each chapter.

When you use all of these components together, you'll discover an innovative, comprehensive system of teaching and learning that prepares students for success in the twenty-first century.

About the Authors

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INTRODUCTION

Language of Dentistry

Specific Instructional Objectives

At the completion of this section, you will be able to meet these objectives:

1. Defend the importance of being fluent in dental/medical terminology.
2. Analyze the structure of the dental terms.
3. Define dental terms.
4. Pronounce dental terms.
5. Apply rules in making words plural.
6. Recognize acronyms, eponyms, and homonyms.
7. Use terms presented in this chapter.

Dental Terminology

If you were going to a foreign country, you would need to learn its language to be able to communicate. In dentistry, you may find the words to be as foreign as another country's language. If you looked at some of the terms and said, "This looks like Greek to me," you would be right! Many of the terms used in **dentistry** and medicine come from Greek and Latin. Before you can study dentistry, you need to learn the dental language.

Every occupation uses a special language that has its own unique slang and technical terms. Computer programmers, for example, speak of "bits" and "bytes" and "megs" and "gigs." For someone unfamiliar with computers, those professional terms seem arcane and meaningless. Similarly, for the person unfamiliar with dentistry, the terms used in dentistry can be cryptic.

Dental **terminology** is the professional language used in dentistry. Dentistry uses medical and dental terminology in describing anatomy, pathology, treatment, procedures, and many other important facts needed to communicate dental care. It is important for the dental assistant to learn the dental language to communicate with other dental professionals and to read and understand dental communications.

Dental assistants have many responsibilities that relate to the proper use of dental terminology. For example, patient records are legal documents, and the assistant must complete them using acceptable terminology. In addition, dentistry uses a very precise and scientific language that may be difficult for the patient to understand. The dental assistant needs to translate

these scientific and technical terms and procedures into terms the patient can comprehend. Accomplishing this requires mastery of dental terminology. In this chapter, you will be given the tools needed to build your dental vocabulary and converse as a dental professional.

Some dental terms may seem strange and impossible to understand at first, but learning them will be much easier if you remember a simple fact: *There are no big words; all big words consist of several small words linked together.* Much like working a jigsaw puzzle, you need to be able to understand the individual pieces and then put them together to form a complete picture. As with learning any language, it will take time to master. With dedicated effort and practice, you will find speaking and interpreting dental terminology enjoyable and a rewarding experience (Figure I-1).

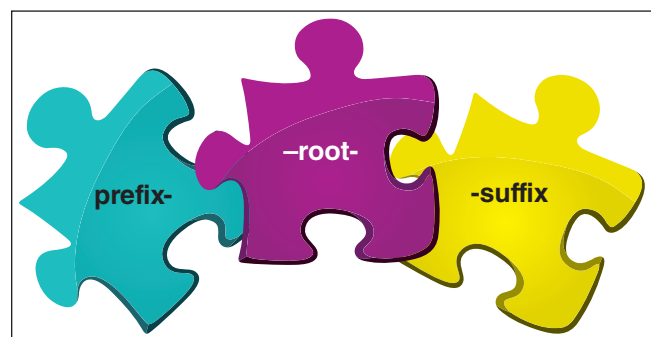


FIGURE I-1

Terminology is like pieces of a jigsaw puzzle fitting together.

Word Parts

Most words have three parts: a **root word**, a **suffix**, and a **prefix**. Some words might consist of only a root; others have several roots, or even several prefixes or suffixes. Learning how to identify roots, suffixes, and prefixes is the first step in mastering terminology in any field.

Root Words

The root is the main body or stem of the word; it is the foundation upon which all terminology is built. All words have a root word. For example, “term” is the root in the word *terminology*. The dictionary defines “term” as: “limit in time, place, set, or appointed period” and as “a word or group of words designating something, especially in a particular field.” Many times you will find more than one definition and use of the term. Some common dental root words are *dent*, *odont*, *gingiv*, *mandible*, *dens*, *oral*, *cavity*, *path*, *odyn*, *coron*, *radic*, *maxill*, and *alveoli*. (Refer to Table I-1 for their meanings and Table I-2 for how they are pronounced.)

Compound Words A compound word is a word composed of two or more root words. For example, the word *toothbrush* is a compound word made from the words *tooth* and *brush*.

TABLE I-1 Meaning of Root Terms

Root Word	Meaning of Root Term
alveol	1. a little cavity, pit, or cell 2. any of the sockets in which the roots of the teeth are embedded; tooth socket 3. any of the tiny air sacs in the lungs
cavity	1. a hollow space within the body, an organ, a bone 2. a hollow space or a pit in a tooth, most commonly produced by caries; a cavity may be artificially made to support dental restorations
coron	1. a crown 2. part of a tooth above the gum
dent	1. a tooth 2. toothlike part
gingiv	1. technical name for gum 2. epithelial tissue attached to the bones of the jaw; surrounds and supports the bases of the teeth
maxill	1. upper jaw
mandibl	1. lower jaw
odont	1. tooth 2. having teeth
odyn	1. pain 2. painful
or	1. mouth 2. opening, entrance
path	1. disease or condition 2. a route, course, or track on which something moves
radic	1. part of a tooth within the tooth socket 2. the rootlike beginning or appearance
stoma	1. surgery, an artificial opening 2. anatomy, a mouth or mouthlike part

TABLE I-2 Pronunciation of Root Words

Dental/Medical Term	Pronunciation of Root Term
alveol	(al- vee -ohl)
cavity	(kav -i-tee)
coron	(<i>kuh</i> - rohn)
dent	(dent)
gingiv	(jin- jahy -v)
maxill	(mak- sil)
mandibl	(man -duh-buhl)
odont	(oh- dohnt)
odyn	(oh- din)
or	(ohr)
path	(pahth)
radic	(rad -ik)
stoma	(stoh -muh)

Affixes

A root word can take on different meanings by adding word attachments to it called **affixes**. Affixes can modify, describe, and change the meaning of root words. They can also give direction and tell what is happening or when it is happening. When a word part is affixed (added) to the end of the word, it is called a suffix. A word part affixed to the beginning of the word is called a prefix.

Combining Forms Sometimes when combining roots and affixes, the word parts have to change to make the term easier to read and pronounce. The new, changed form of the word is called a combining form.

No combining form is needed when combining two words parts in which the second word part begins with a vowel. For example, the word *gingivitis* (meaning inflammation of the gums) is formed by combining the root word *gingiv* (meaning gum) with the suffix *itis* (meaning inflammation). Since the second word part, *itis*, begins in a vowel, no combining form is needed.

When a word part that follows another word part begins with a consonant, you must add a **vowel** (a, e, i, o, u, and y) to make a **combining form**. For example, the word *thermometer* combines the prefix *therm* (meaning heat) with the root word, *meter*, which is an instrument used for measuring. To make the combining form, we add “o” to make “thermometer”—an instrument used to measure a patient’s body heat; “o” is the most commonly used combining vowel.

Suffixes

Suffixes are attachments added to the end of the root word to modify, change, or add to the meaning to form another word. Although prefixes are added to the beginnings of words and suffixes are added to the end, we will discuss suffixes first because they show how a word is used in a sentence and what part of speech the word represents. In dental terminology, suffixes are

used to identify diseases, conditions, and diagnostic, operative, and surgical procedures. A dental term will have only one suffix.

Let's see how suffixes change the meaning of words by adding suffixes to the word defined previously: *term*. You learned that the word *term* has two meanings; limit in time, place, set, or period, and a word descriptive in a particular field. The combining form is *termin*. Here are some suffixes that can be attached: -al, -ate, -ology. The new words are the following:

- **Terminal:** an adjective meaning "leading to an ultimate end, or death." A terminal illness would be an illness that is ultimately fatal. Terminal can also be a noun that means "either end of a transportation line" such as a bus terminal.
- **Terminate:** a verb meaning "to dismiss from a job, to end, to come to an end of time, or to kill."
- **Terminology:** a noun meaning "the study of specialized words related to a particular subject."

When a suffix is written alone, it is usually preceded by a hyphen (for example, "-ed") indicating that a word part precedes it to form a complete word. Tables I-3 through Table I-6 define common suffixes indicating parts of speech. Table I-7 and

Table I-8 list some common suffixes used in dental diagnosis and treatment.

Prefixes

Prefixes are attachments added before the root word to make the meaning more precise. Most prefixes can be added to the root word without changing the form of the prefix or the root word. When a prefix is written alone, it is usually followed by a hyphen indicating that a word part is added after the prefix (pre-) to form a complete word. A dental term may have more than one prefix to describe it.

Prefixes Describing Diagnosis Anatomical structures, diseases, and conditions are examined for diagnostic findings. They are often described by color and comparison to what is normal. The most common colors used in dentistry are listed in Table I-9, and Table I-10 describes findings from diagnosis.

Prefixes Describing Location When describing anatomy, diseases, and conditions, the exact location must be recorded.

TABLE I-3 Suffixes Used to Form Nouns

-a = singular ending of noun	-acy = like, state, or quality, pertaining to -cy	-ine = belonging to	-ness = condition
-age = belonging to, related to	-dom = place or state of being	-ist = doer	-on = chemical substance
-ance = state or quality of -ence	-er = a person or thing	-ism = state, belief, condition	-or = a person or thing
-ase = names enzymes	-hood = state or condition of being	-ity = state, quality	-tion = act of -sion
-ation = act of	-ia = condition or quality	-ium = membrane -eum	-ure = action, result
-ax = anatomical structure ending	-ion = action state	-ment = state, act	-y = to form familiar names

TABLE I-4 Suffixes Used to Form Adjectives

-able = capable of being -ble	-eal = pertaining to	-ible = capable of being	-oid = resembling, like
-ac, -al, -an, -ar, -ary, -eal, -ic, -ive, -tic = pertaining to; having quality of	-en = resembling, made of	-ic = pertaining to; -ical having quality of	-ous = like, full of -ious
-an = belonging to -ian	-ent = full of	-il = pertaining to, capable of -ile	-tic = pertaining to
-ant = full of	-eous = composed of	-ish = like	-y = characterized by
-ar = pertaining to; having quality of	-form = having the shape or form	-ive = having the nature of	
-ary = like, connected with	-ful = characterized	-less = without	

TABLE I-5 Suffixes Used to Form Adverbs

-ably = capable of	-less = lacking	-ward = indication direction
-acious = full of -icious	-like = similar to	-wide = a given space
-fold = having so many parts	-ly = in a certain manner	-wise = direction, manner
-ily = in a certain manner	-most = quality, order	
-ive = tendency, inclination	-ular = relating to, resembling	

TABLE I-6 Suffixes Used to Form Verbs

-ate = process	-ify = to make, create
-ed = past action	-ing = action of
-en = to be, to become	-ise = to become, to agree with
-fy = to make, cause to be	-ize = to affect, resemble
-iate = to begin, process	-lyse = loose, dissolve, break into

TABLE I-7 Suffixes Used in Diagnosis

-algia = pain	-ology = study of
-dynia = pain	-oma = tumor
-edema = swelling	-opsy = view
-gnosis = able to discern, come to know	-osis = abnormal condition
-ia = condition	-path = disease
-iasis = pathological condition	-phylaxis = watching, guarding
-itis = inflammation	-rrhage = excessive bleeding, hemorrhage -rrhagia

TABLE I-8 Suffixes Used in Dental Procedures

-centesis = surgical fixation	-plasty = surgical repair
-ectomy = excision, surgical removal, cutting out	-rrhaphy = suture
-ive = function	-stomy = formation of an opening
-pexy = surgical fixation	-tomy = incision, cutting into

TABLE I-9 Prefixes Describing Color

alb-, albin- = white, referring to lack of pigment	erythr- = red
chlor- = green	leuk- = white
chrom- = color chromat-	melan- = black
cyan- = blue	xantho- = yellow

Common prefixes used to describe specific location, position, and direction are listed in Table I-11.

Prefixes Describing Amounts In describing anatomical structures, diseases, and conditions, the dental professional has to know and explain how many, how much, and what size. Prefixes can describe numbers, quantity, size, and degree of change. See how many of these prefixes you already know in Table I-12.

Strategy for Building Dental Vocabulary

After what you've just read, do you think you would be more or less likely to suffer from *hippopotomonstrosesquipedaliophobia*? You may be thinking, "What does that mean and how do you expect me to answer the question?" Remember, however, there are no big words, just combinations of several smaller word parts. This is the first place to start when determining the meaning of a word.

TABLE I-10 Prefixes Describing Findings

brady- = slow movement	gloss- = tongue (referring to condition)	onc- = tumor, mass swelling
cheil- = lips (referring to condition)	hemo- = blood	pharyn- = throat, windpipe
dia- = thorough, complete knowledge	labi- = lips (referring to location) lingual- = tongue (referring to location)	prog- = probable outcome, course
dys = bad, abnormal, impaired	lymph- = clear fluid that bathes and nourishes tissues of body; lymphatic system	sial- = saliva, salivary gland
eu- = normal	mal- = bad, wrongful, ill mis- = bad, wrong,	tachy- = rapid, accelerated

TABLE I-11 Prefixes Describing Location

ab- = away from abs-	ex- = beyond	post- = after, behind
ad- = toward	infra- = beneath, below	pre- = before, in front of
ante- = before, forward anter- = front	inter- = between	proxim- = near, adjacent
dextr- = right side	intra- = within	sub- = under
de- = away from, ending	later- = toward the side	super- = above supra-
dist- = directed away from midline	mes- = middle med-	sy-, syl-, sym-, syn- sys- = together
en- = inside, within, inner end- ent-	peri- = around	trans- = across, through

TABLE I-12 Prefixes Describing Amounts

a- = without, not an-	iso- = equal, like	poly- = many, excessive
bi- = two	macro- = large, long, big	quad- = four quadr-
di- = two diplo- = double	meg- = great, large mega- megal-	semi- = half
hemi- = half	micro- = small	tetra- = four
homo- = same	mon- = one	tri- = three
hyper- = above, beyond, excessive	multi- = many	uni- = one
hypo- = under, deficient	non- = not, lack of	sext- = six

Break the Word into Its Parts

To break the word into its various word parts, first identify any affixes (prefixes and suffixes) as well as any combining vowels, remembering that the most common combining vowel is “o.” For example, this word (*hippopotomonstrosesquipedaliophobia*) contains no prefixes and one suffix (-ia). It also has four combining vowels—three “o’s” and one “i.” From this information, we can identify five root words: *hippo-*, *monstro-*, *sesqui-*, *pedalio-*, and *phob-*, as well as the suffix *-ia*.

Define the Meaning of Each Word Part

Next define the meaning of each root word and affix. If you are not sure of the meaning, look it up in a dictionary:

hippopoto = hippopotamus; very large, massive mammal;
second-largest land mammal

monstro = monstrous; abnormal, hideous, or unnatural in size,
frightful in appearance

sesqui = one and a half; half as much again; many syllables

pedalio = relating to foot

phob = an intense, abnormal, or illogical fear of a specified thing;
irrational fear of a specific object, activity, or situation
that leads to a compelling desire to avoid it

-ia = disease; pathological, abnormal condition or mental disorder

Try to define the word.

Put the Parts Together

Now put the word parts together. Remember that the root word attached to the suffix is the stem upon which the word is built and is therefore the key to its meaning. In this case, the key to

this word is *phobia*, which means a mental disorder caused by an intense fear of something. The rest of the word parts tell what that something is.

You have the meaning of the word parts. Can you define it now?

Assemble the Meaning

The term will not make sense until you put together the meanings of each of the word parts that compose it. Generally, you start with the suffix and key root word, and then you return to the start of the word and define the meanings of the rest of the word parts in order. In this case, that would produce: *A mental disorder, caused by irrational fear of something large and monstrous, with many syllables, a foot and a half long.* Or, as the dictionary defines *hippopotomonstrosesquipedaliophobia*: a fear of long words (words a foot and a half long with many syllables).

Use Your Senses

Cognitive research has proven that the best way to learn is to involve as many senses as possible. A popular quote says, “We learn 10% of what we read, 20% of what we hear, 30% of what we see, 50% of what we see and hear, 70% of what we discuss with others, 80% of what we experience, and 95% of what we teach to someone.” Try to involve as many senses as possible in learning a new term.

For example, try to make a mental picture of what the word means. Imagine a person’s reaction to a phobia: shortness of breath, smothering sensations, pounding heart, shaking, sweating, and nausea. Studying models or diagrams of technical terms, or drawing pictures, can help you commit terminology to memory models or diagrams and you can draw a picture of it.

Saying new words aloud also will help you retain new information. Dictionaries list the phonetic spelling of every word before defining it and usually provide a guide to the less familiar symbols often used in phonetic spellings. There are also online “talking dictionaries” that will pronounce any word aloud for you.

Make It Meaningful

Whenever possible, find the item you are learning and handle it; nothing can substitute for hands-on learning. This kind of “effortful processing” leads to more stable learning. According to the Association for Psychological Science, we encode based on meaning—we remember what is meaningful to us.

Meaningful repetition is the key to long-term memory, so make reviewing terms a part of your daily studies. However, do not simply memorize words; interact with and use them actively. Start a log of vocabulary words and practice using dental language every day. Take advantage of your learning environment and offer to peer-tutor a classmate who is struggling to learn the information. Explain to your friends and family what you are learning. This is good practice for teaching your patients in

the dental office. Remember, we learn 95% of what we teach to someone. Think that might be why your teachers remember so much detail?

Pronunciation

When you look up a word in the dictionary to find its meaning, you will notice that the word’s **pronunciation** is also provided. It is important to learn how to say the word correctly (pronounce) to understand and remember what you have read. Your memory improves with the more senses you use. By pronouncing the word, you use your ears and mouth to speak the word. It is also important to pronounce words correctly so other dental professionals will know what you are saying.

Pronunciation is defined as the act of producing sounds of speech within the reference of a standard of correctness or acceptability. There is supposedly a correct manner of pronouncing sounds in any given language. In medical/dental terminology, there is often more than one correct way to pronounce the term. The most accepted pronunciation is generally listed first in the dictionary. However, certain terms do have more than one acceptable pronunciation. This is often due to different parts of the country and even the world. But, there is only one proper spelling of a term. Any change or error in spelling can totally change the meaning of a word; it may have an entirely different meaning that may result in improper diagnosis or treatment.

In this chapter, you will study how to pronounce a word using the **phonetic** transcription of a word. Dental term pronunciations are spelled out within parentheses and are broken into phonetic syllables. A syllable is a basic unit of speech generally containing only one vowel sound. For example, the word *base* contains one **syllable** and *basic* contains two syllables. Phonetics is what the term sounds like by an accepted standard of the human speech sounds and stress patterns of a syllable. Each term is broken into “sounds-like” syllables. The word *base* is phonetically translated as “beys” written as one syllable. Basic is phonetically translated into two syllables “**bey**-sik.” Notice that the syllables are separated by a dash and the first syllable is in bold font. The bold font is used to show stress patterns of the syllables.

Syllables in bold font receive the most stress (emphasis, spoken louder) than the other syllables. If another syllable has intermediate stress (slightly louder), quotation marks follow the syllable. Otherwise, all syllables are equally stressed. Can you pronounce pronunciation (pruh-nuhn’-see-**ey**-shuh n)? Just say it as it is spelled out.

In Table I-2, the root words defined now have the phonetic pronunciation. Practice saying these words.

Some combinations of letters are misleading in figuring out how to pronounce them. These combinations include *ps* (psych—only the s is pronounced); *pn* (pneum—only the n is pronounced); *gn* (gnath—only the n is pronounced); and *ph* (physio—ph sounds like f). Be aware of these misleading pronunciations as you study terms.

Plurals

There are several basic rules for creating the plural forms of words. Add *es* for nouns that end in *s*, *ch*, or *sh*. If the word ends in *y* and has a preceding consonant (such as allergy), change the *y* to *i* and add *es* (allergies). When looking up terms, the plural form is often provided. It will be indicated by the abbreviation *pl* before the plural form. To learn more about the rules for forming more plurals, study Table I-13.

Acronyms/Eponyms/Homononyms

Not all dental language consists of word parts. Some of the terms are composed of letters representing a phrase. Others may be named after a person or place. There are even words that are spelled differently, but sound the same. As a dental professional, you need to know how to interpret all forms of dental terminology.

Acronyms

An **acronym** is a word formed from the initial letter or groups of letters or words in a set phrase or series. In the technology and health industry, there is always some new acronym. In making an acronym, the industry tries to choose a catchy, pronounceable series of letters and make a name out of it. Some of the more common acronyms that are related to dentistry are listed in Table I-14.

Eponyms

Eponyms are terms used in medicine and dentistry that are named after people, places, or things. Because of the nature of medicine, new discoveries are often attached to the people who made the discovery. The names of drugs, diseases, and treatments are named after scientists and doctors who discovered or invented them. Sometimes the name is derived from

the proper name of a real or mythical person or place. Since eponyms are named after proper names, the term needs to be capitalized.

It usually involves a lot of research and publishing an article in a respected medical journal to have a medical eponym awarded. Down's syndrome is an eponym for the English physician, John Down, who described the syndrome. Down's syndrome is a genetic condition that is characterized by the presence of an extra copy of genetic material on the twenty-first chromosome. The syndrome may have some impairment of cognitive ability and physical growth and specific facial characteristics.

On occasion, an eponymous disease is named after a famous patient. Lou Gehrig's disease was named after Lou Gehrig, who was an American Major League Baseball player nicknamed "The Iron Horse" for his durability. Many eponymic diseases also have a more descriptive name. Lou Gehrig's disease is also called ALS (amyotrophic lateral sclerosis). ALS is a progressive neurodegenerative disease that affects nerve cells in the brain and the spinal cord. This disease's progressive degeneration of the motor neurons eventually leads to paralysis and to the patient's death.

Legionnaires' disease was given the name when an outbreak of pneumonia occurred among people attending an American Legion convention. Some famous medical signs and drugs are eponyms. The sounds heard when checking blood pressure called the Korotkoff sounds were discovered by Nikolai Korotkov, a cardiologist. Charles Mantoux, physician, is the developer of the eponymous serological test for tuberculosis, known as the Mantoux test.

TABLE I-13 Rules of Making Plurals

Singular Ending	Plural Ending	Examples
a	ae	gingiva, <i>pl</i> gingivae
ax	aces	thorax, <i>pl</i> thoraces
ex	ices	apex, <i>pl</i> apices
itis	ides	pulpitis, <i>pl</i> pulpitudes
ix	ices	cervix, <i>pl</i> cervices
ma	s or mata	stoma, <i>pl</i> stomas stoma, <i>pl</i> stomata
nx	nges	pharynx, <i>pl</i> pharnges
oma	s	odontoma, <i>pl</i> odontomas
on	a	protozoon, <i>pl</i> protozoa
sis	oses	diagnosis, <i>pl</i> diagnoses
um	a	bacterium, <i>pl</i> bacteria
us	i	alveolus, <i>pl</i> alveoli
y	ies	biopsy, <i>pl</i> biopsies

TABLE I-14 Acronyms

Acronym	Translation
ADA	American Dental Association
ADAA	American Dental Assistants Association
ADHA	American Dental Hygiene Association
ALARA	As Low As Reasonably Achievable
CDA	Certified Dental Assistant
CDC	Centers for Disease Control
CODA	Commission on Dental Accreditation
DANB	Dental Assisting National Board
DDS DMD	Doctor of Dental Surgery Doctor of Dental Medicine
BA BS MS MA	Bachelor of Arts Bachelor of Science Master of Science Master of Arts
OSHA	Occupational Safety and Health Administration
PPE	Personal Protection Equipment
RDA EFDA	Registered Dental Assistant Expanded Function Dental Assistant
RDH LDH	Registered Dental Hygienist Licensed Dental Hygienist

Many human anatomical parts are named after people. One of the founders of the science of human anatomy, Bartolomeo Eustachi, gained the reputation of having created the science of human anatomy because of the number of anatomical structures he discovered and wrote about. One of such structures, named after him, is the eustachian tube. The Achilles tendon was named after the Greek mythological character, Achilles.

Homonyms

Homonyms are words that sound the same, but the spelling is different and so is the meaning. These words can cause confusion in understanding the spoken word. Care should be taken to check the spelling and meaning of such words to prevent making this mistake. Some of the more common homonyms are listed in Table I-15.

Word Usage Reflects on the Dentist

Patient records are legal documents and can be the dentist's best defense in court if an incident results in litigation. All office records must be completed in detail using acceptable terminology and proper grammar.

Following is an example of an assistant's documentation of a patient's reaction after anesthetic. See if you can identify where the assistant had problems with homonyms.

The patient had sweet poring down her forehead. When asked if she had ever experienced this before, she said she felt she had a blood sugar problem and ate a very rich, sweat desert before coming for her appointment. The dentist told her she should follow up with her physician and eat well balanced meals especially on daze of her appointment. Unprofessional patient records can be the offense's best evidence.

Have you ever heard that a person's grammar reflects a person's level of education? Mastering dental terminology mirrors the assistant's knowledge of dentistry and reflects on the dentist.

TABLE I-15 Homonyms

Homonyms	Definitions
auxiliary axillary	a person that helps near the armpit
bite byte	a mouthful 8 bits
die die dye	exact replication of a structure; used as pattern to make dental appliance cease to live to color or stain
elicit illicit	to draw unlawful
esthetics aesthesia	concept of beauty; also spelled aesthetics ability to feel
facial fascial	relating to the face a band of tissue supporting internal parts of the body
heal heel	to cure of disease hind part of foot
know no	to be fully aware of meaning and implications denial or refusal
oral aural aural	pertaining to the mouth pertaining to the ear pertaining to an aura; sensation preceding a migraine or epileptic attack <i>two different meanings for same spelling</i>
pain pane	it hurts a single panel of glass
palpation palpitation	examine by touch abnormally rapid and violent beating of the heart
plural pleural	more than one related to lung
pore pore pour poor	minute opening to read or study carefully to cause flow of liquid to have little or no money
right right write rite	what is good, proper, and just side opposite location of the heart form letters with pen, pencil, etc formal act or ceremony
site cite sight	location to refer vision
suture suture	line of junction of two bones joining edges of open by stitches
week weak	a period of successive days not strong

Key Terms: Definitions and Pronunciation

Each chapter will end with a Key Terms feature. New terms introduced in the chapter appear in the first (far-left) column of the Key Terms table. Below each term is the phonetic spelling to help with the pronunciation. The middle column breaks the term into word parts along with the definition of each part. The last column lists the dictionary definition of the term. The terms in the Key

Terms chart appear in blue font within each chapter. Key Terms features and charts help you learn the meanings of the terms in each chapter before you start reading, so you can more easily build your dental and medical terminology.

It will be helpful to learn a few word parts at a time and recognize them when you see them in a term. It is much better to understand the meaning of the word parts and learn how to build words than to try to memorize, look up, or skip over every new word you encounter.

Review Questions

Multiple Choice

- What word part is the foundation and main meaning of the word?
 - prefix
 - root
 - suffix
 - combining vowel
- What word part is *sub* in the word *submandibular*?
 - prefix
 - root
 - suffix
 - combining vowel
- What word part is *ular* in the word *submandibular*?
 - prefix
 - root
 - suffix
 - combining vowel
- Which dental term means “below the lower jaw”?
 - alveolectomy
 - gingivitis
 - submandibular
 - supramaxilla
- Which dental term means “inflammation of the gums”?
 - alveolectomy
 - gingivitis
 - periodontitis
 - supramaxilla
- A _____ is the basic unit of speech generally having only one vowel sound.
 - pronunciation
 - phonetic
 - syllable
 - simple term
- What is the descriptive word for “sounds like” that is used to help the reader say the word correctly?
 - pronunciation
 - phonetic
 - syllable
 - simple term
- Which is the plural for prognosis?
 - prognosex
 - prognosises
 - prognoses
 - prognosisies
- Which is the plural for maxilla?
 - maxillas
 - maxillamata
 - maxillae
 - maxillaces
- For what is the following sentence an example?
The dental auxiliary was requested to take the patient's axillary. The patient told the dentist about their heart palpitations during the palpation examination.
 - acronym
 - eponym
 - homonym
 - compound

Critical Thinking

- Why does the assistant need to know terminology when talking to the patient?
- How will lack of knowledge of dental terminology affect the assistant's ability to communicate?
- Place a slash (/) between the word parts for the following terms. Which term has a combining vowel?

a. periodontal	c. alveolectomy
b. gingivitis	d. supramaxillary
- Why is it important to say a word correctly?
- Referring to the sentence below, what is the acronym and what is the eponym?
A patient was diagnosed with Vincent's disease, which is also referred to as ANUG.

Key Terms

Term and Pronunciation	Meaning of Root and Word Parts	Definition
acronym (ak-ruh-nim)	acro- = denoting something -nym = name, word	a word formed by combining the beginning letters of a name or phrase
affix (uh-fiks)	af- = to add, addition fix- = fasten, secure	a letter or a group of letters added to a word to change its meaning
combining vowel (kuhm-bahyn-ing) (vou-uhl)	combine = to unite for a common purpose -ing = to unite for a common purpose vowel = vocal letter (a, e, i, o, and y)	a vowel connects roots to suffixes and roots to other roots
dentistry (den-tuh-stree)	dent = relating to the teeth -ist = person who practices -ry = indicating place of business	the branch of medical science concerned with diagnosis and treatment of diseases/disorders of the teeth and gums
eponym (ep-uh-nim)	epi- = after nym = name, word	the person for whom something (such as a disease) is to be named
homonym (hom-uh-nim)	homo- = same nym = name, word	a word the same as another in sound and spelling but different in meaning
phonetic (fuh-net-ik)	phon = sound, voice -tic = pertaining to	pertaining to speech sounds in pronouncing words
prefix (pree-fiks)	pre- = before, in front of fix- = fasten, secure	a letter or a group of letters added to the front of a word to change its meaning
pronunciation (pruh-nuhn-see-ey-shuhn)	pronounce = to speak in correct way -ate = product of a process -ion = action state	the act of producing sounds of speech using an accepted standard of sound and stress patterns of a syllable or word
root word (root) (wurd)	root = essential, fundamental word = a unit of language; functions as carrier of meaning	the form of a word after all affixes are removed, main body or stem of the word; foundation for word building
suffix (suhf-iks)	suf- = secondary part of fix- = fasten, secure	a letter or a group of letters added to the end of a word to change its meaning
syllable (sil-uh-buhl)	syl- = together, with lab = shorten -le = denoting repeated or continuous action	a basic unit of speech generally containing only one vowel sound
terminology (tur-muh-nol-uh-jee)	term = a word designating something in a particular field -ology = to study, branch of knowledge	the body of specialized word relating to a particular subject, field, science, art



SECTION I

Dentistry as a Profession

- 1 | Introduction to the Dental Profession
- 2 | Psychology, Communication, and Multicultural Interaction
- 3 | Ethics, Jurisprudence, and the Health Information Portability and Accountability Act

CHAPTER 1

Introduction to the Dental Profession

Specific Instructional Objectives

At the completion of this chapter, you will be able to meet these objectives:

1. Use terms presented in this chapter.
2. Identify the major milestones in dental history from ancient times to present day.
3. Name the individuals who had a great impact on the profession of dentistry.
4. Identify the people who promoted education and organized dentistry.
5. State the nine specialties of dentistry.
6. Describe career skills of the direct and indirect care dental team members .
7. List the education required for each dental career path.
8. List the professional organizations that represent each dental career path.
9. Explain the importance of being cross-trained.
10. Discuss the advances in dentistry.
11. Identify career opportunities for a dental assistant.

Introduction

Humans have been plagued with dental problems from the very beginning of time. It is important to be familiar with the historic struggles that took place and contributions that were made to advance the dentistry profession into what it is today.

History of Dentistry

Beginning in ancient times, dental work was done by physicians. Often, each physician specialized in only one area of care for one part of the body. In fact, during the fifth century BC, a Greek historian named Herodotus wrote, "all the country is full of physicians, some of the eyes, some of the teeth, some of what pertains to the belly, and some of the hidden diseases." The earliest recognized figure in dentistry is Hesi-Re. Hesi-Re practiced in 3000 BC. Excavations of the Egyptian pyramids have shown that the Egyptians paid great attention to teeth cleaning, relieving toothaches, and restoring teeth. Also discovered in the burial remains of Egyptian mummies of that time were teeth filled with gold **restorations**. Table 1-1 provides a history of major developments in dentistry.

During these early times, dentistry primarily consisted of removing teeth when pain occurred. Some evidence has been found on human skulls that holes were drilled near the roots to allow infection to drain so that pressure in an abscessed tooth could be relieved. Other dental problems that date from ancient times derived from food preparation techniques. Grains were ground in stone bowls with stone pestles. During this process, particles of stone mixed with the

TABLE 1-1 Timeline of Dental History

Era	Events
Beginning of time	Tooth decay is noted.
3000 BC	First dentist, Hesi-Re, is recorded.
460–322 BC	Written information about tooth decay is recorded by Aristotle and Hippocrates.
460–377 BC	Oath of Hippocrates.
384–322 BC	Attention to oral hygiene (Diocles of Carystus).
1300–1368	Hygienic rules (Guy de Chauliac).
1452–1519	Tooth morphology identified (Leonardo da Vinci).
1678–1761	Founder of modern dentistry (Pierre Fauchard).
1760–1819	Josiah Flagg develops the dental chair.
1768–1770	Paul Revere places advertisements in a Boston newspaper offering his services as a dentist.
1790	James B. Morrison constructs the first known dental foot engine, which he adapted from his mother's spinning-wheel foot treadle.
1832	James Snell invents the first reclining dental chair.
1840	Horace Hayden and Chapin Harris establish the Baltimore College of Dental Surgery.
1840	American Society of Dental Surgeons established.
1841	Alabama enacts the first dental practice act to regulate dentistry.
1844	Horace Wells, a Connecticut dentist, discovers that nitrous oxide can be used for dental pain relief.
1859	American Dental Association (ADA) created.
1866	Lucy Beaman Hobbs Taylor, the first woman to earn a dental degree, graduates from Ohio College of Dental Surgery.
1869	Dr. Robert Tanner Freeman, the first African American to earn a dental degree, graduates from Harvard University Dental School.
1871	First commercially manufactured foot-treadle dental engine is patented by James B. Morrison.
1885	First “lady in attendance” employed by Dr. C. Edmund Kells.
1890	Dr. Ida Gray, the first African American woman to earn a dental degree, graduates from University of Michigan School of Dentistry.
1895	X-rays discovered (Wilhelm Conrad Roentgen).
1907	“Lost wax” casting machine is invented by William Taggart.
1913	Fones School of Dental Hygiene established.
1923	American Dental Hygienists' Association (ADHA) created.
1924	American Dental Assistants Association (ADAA) established; first president was Juliette Southard.
1930	First dental specialty board is founded, the American Board of Orthodontics.
1938	First synthetic bristle (nylon) toothbrush appears on the market.
1945	Water fluoridation era begins in the cities of Newburgh, New York, and Grand Rapids, Michigan.
1947	Dental Assisting National Board, Inc. (DANB) is established.
1950	First fluoride toothpastes are marketed.
1960	Four-handed, sit-down dentistry is utilized.
1970	The Occupational Safety and Health Administration is created by the U.S. Congress.
1980	Per-Ingvar Branemark introduced the technique for the osseointegration of implants.
1982	Hepatitis B vaccine becomes available.
1987	First digital radiography system invented by Dr. Francis Mouyen.
1988	DIAGNOdent invented by Kavo for digital detection of dental decay
1990	Tooth-whitening commercial products are marketed.
1992	Occupational Safety and Health Administration's Bloodborne Pathogens Standard becomes effective.
1997	The YAG laser, approved by the Food and Drug Administration, is used to treat tooth decay.
2000	Invisalign braces made available to public.
2006	VELscope fluorescent device to detect oral cancer became commercially available.

grain. This grit in the food caused severe wear of the biting (occlusal) surfaces of the teeth and possible pulp exposure.

Hippocrates (460–377 BC), the father of medicine, attempted to explain health and disease. Hippocrates was a pivotal figure in the history of dentistry. At the time, the theory that magic, demons, and spirits caused illnesses was an accepted notion. Hippocrates did not agree with those theories and started to teach a more educated method of medical care and medicine. Due to his advancements in the medical field, he was given the title “Father of Medicine.” Hippocrates was not just interested in medicine, he also had opinions pertaining specifically to dentistry. He felt it was extremely important that teeth be kept in good condition, and he even developed his own toothpaste and mouth rinse to aid in oral health. He wrote about formation, **eruption**, diseases of teeth, and methods of dental treatment. He designed and invented some **extraction** instruments to make the removal of teeth easier and safer. Hippocrates felt strongly that physicians have an obligation to their patients to not allow any wrongdoing and adhere to **confidentiality** when treating all patients. From this belief, the establishment of the Hippocratic Oath was founded. To this day, the Hippocratic **Oath** is still a basic code of ethics for medical and dental professionals to “do no harm.” An Athenian physician and pupil of Aristotle (384–322 BC), Diocles of Carystus, stated that oral hygiene should get proper attention, and he even gave instructions to this end. During the next couple of centuries, more importance was placed on good oral hygiene. A number of cleaning powders were made from crushed bones, oysters, and egg shells. At times, these substances were mixed with honey to make a paste to use in cleaning.

Later Progress of Dentistry

In France, a surgeon named Guy de Chauliac (1300–1368) became one of the fourteenth century’s most influential authors on surgery. He also wrote the “Hygienic Rules for Oral Hygiene.”

It is now known that the information given by de Chauliac was not entirely accurate. However, because it was based on sound logic, much of it is used today. For example, it is well known that

sticky, sweet foods increase dental decay. During the fifteenth and sixteenth centuries, artists became more interested in human anatomy to enhance the accuracy of their artwork. Leonardo da Vinci (1452–1519) painstakingly dissected the human skull and then drew his discoveries. He was the first to make a distinction between premolars and molars. His writings further define the morphology of teeth.

Pierre Fauchard (1678–1761), a French dentist, organized all known information about dentistry in a manuscript titled “Le Chirurgien Dentiste,” relating to a title he used to refer to himself as a surgical dentist. It was clearly written and had step-by-step pictures that depicted easy-to-follow procedures. He rejected the idea that a tooth worm caused decay and noted that “caries” (his term for decay) were a result of a “hormonal imbalance” and was an early advocate of treating diseased **gingival** tissue. He combined early information and operative methods for replacing or transplanting teeth. He even noticed that he could straighten teeth by using gold braces that were fastened by waxed linen or silk threads and allowed the teeth to follow a pattern of wires. Pierre Fauchard developed a manual drill for use in dentistry that was powered by a catgut twisted around a cylinder. Fauchard believed that once the decay had been removed, something should replace the missing tooth structure. He would use tin or lead as the replacement. If the decay was too deep and the nerve was disturbed, he utilized oil of cloves to calm down the nerve. This technique is still used today. He believed that the use of urine as a mouthwash could maintain good oral hygiene. Fauchard also believed that in the event a tooth became avulsed (knocked out), the tooth should be reimplanted. Pierre Fauchard’s findings were so highly admired and beneficial in dentistry that they were used for over a hundred years. Many refer to Pierre Fauchard as the “Founder of Modern Dentistry.”

Wilhelm Conrad Roentgen (1845–1923), a German physicist, discovered x-rays in 1895. This discovery allowed dentists to further their knowledge of the diseases and structures of the mouth.

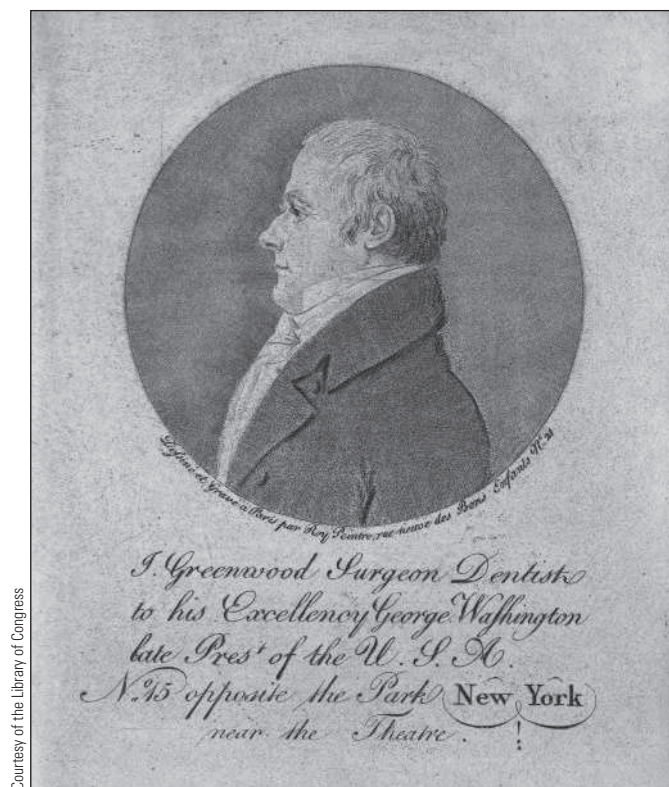
Progress of Dentistry in the United States

One of the first dentists to arrive in the United States from England was Robert Woofendale. Woofendale placed an advertisement in the *New York Mercury* on November 17, 1766, stating that he “performs all operations upon the teeth, sockets, gums, and palate, likewise fixes artificial teeth, so as to escape discernment.” Soon after Woofendale arrived, John Baker came and started advertising in the Boston area. He spoke and wrote about fillings and artificial teeth. Baker was well known and was one of the dentists who treated George Washington. John Greenwood (1760–1819) was said to be the first president’s favorite dentist (Figure 1-1). Greenwood had very little formal education but was a proficient practitioner in the eighteenth century. He thought children should care for their teeth and offered parents reduced rates for children’s dental care. He also thought that tartar came from bad breath and was adamant about the regular removal of it for good oral health.

Hygienic Rules for Oral Hygiene

Written by Guy de Chauliac

1. Avoid food that putrefies readily.
2. Avoid food or drink that is too hot or too cold, and especially avoid swallowing extremely cold food after extremely hot food, and vice versa.
3. Do not bite into things that are too hard.
4. Avoid foods that stick to the teeth, such as figs and confections made with honey.
5. Avoid certain foods known to be bad for the teeth (his example was leeks).
6. Clean the teeth gently with a mixture of honey and burnt salt to which some vinegar has been added.



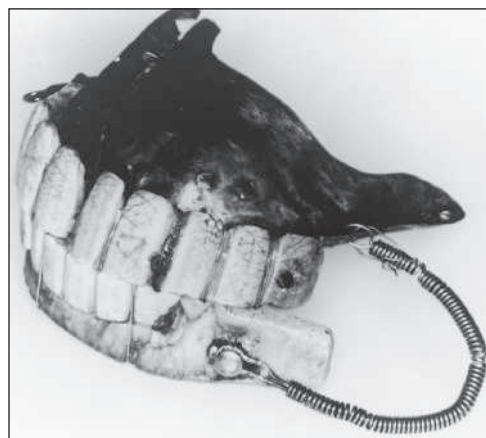
Courtesy of the Library of Congress

FIGURE 1-1
John Greenwood.

At one time or another, George Washington was probably treated by every notable dentist of the time. A number of references in his diary note continual pain and discomfort from his teeth. At the time the picture that is currently on the one-dollar bill was painted, the president had only one tooth left, a lower-left bicuspid (premolar). In fact, the artist had to pad out the cheeks and lips with cotton to give the president's sunken face a more normal appearance. Washington's last set of **dentures**, made by Greenwood, were composed of ivory and gold and had two springs holding them together (Figure 1-2). A number of dentures were made for the president; however, contrary to popular belief, they were not made of wood.

Paul Revere (1735–1818), a silversmith (Figure 1-3), was a dentist for several years, but his greatest contribution to dentistry was making surgical instruments and artificial teeth. Paul Revere is also the first dentist documented to use **forensics** to identify the remains of a soldier from the Revolutionary War by an artificial tooth he had made for him. He may have had a part in training a notable dentist of the late 1700s, Josiah Flagg. Flagg's father was a partner to Revere. Flagg, a skilled surgeon, was accomplished in corrective procedures on cleft lips, orthodontics, **endodontics**, and operative dentistry. However, one of his major contributions to dentistry was the construction of a dental chair. It had an extension on the arm to hold dental instruments and an adjustable headrest.

In the early 1800s, U.S. dentistry took a giant leap forward. The establishment of a popular democracy—with the opportunity for personal financial gain, free public school education,



Courtesy of the National Museum of Dentistry, Baltimore, MD

FIGURE 1-2

The last dental prosthesis worn by George Washington was made for him by John Greenwood. It is made of gold and ivory and is held together with springs.



Courtesy of the Paul Revere Memorial Association, Gift of Miss Marion Cole. Photo: John Miller

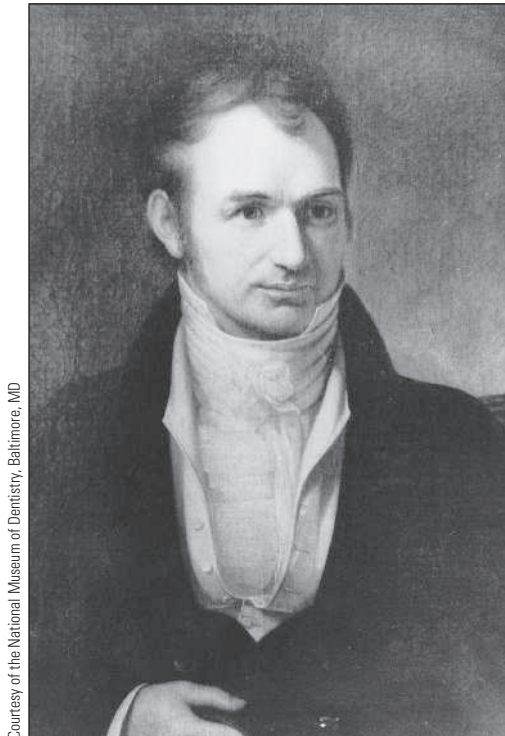
FIGURE 1-3

Paul Revere, shown as a silversmith.

and population growth—prompted some of the most notable dentists in the world to relocate to America. The literature and knowledge base expanded a great deal during this time. Most large cities now had resident dentists rather than traveling barbers who extracted teeth and sold tooth powders. The dentists of the time were better educated and involved in the communities they served. The profession was progressing far beyond massive tooth removals and occasional cleanings. Additionally, as dental techniques improved and developed, so did dental materials. The first dental engine with a functioning handpiece, motor, and foot treadle was manufactured and patented by James B. Morrison in 1871. This apparatus allowed dentists to restore teeth much more quickly. Organized dentistry was rapidly approaching.

Education and Organized Dentistry

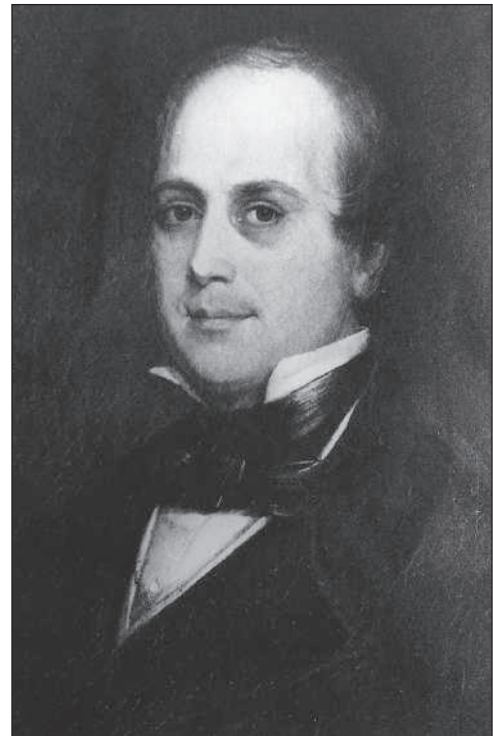
Horace H. Hayden (1769–1844) (Figure 1-4) sought dental care from John Greenwood, the dentist who cared for George Washington. Hayden was inspired and encouraged to take up dentistry as a vocation. He became very active in the dental profession, writing for journals and lecturing on medical and dental topics. Hayden practiced dentistry in Baltimore,



Courtesy of the National Museum of Dentistry, Baltimore, MD

FIGURE 1-4

Horace Hayden, one of the founders of professional dentistry in the United States, helped establish the world's first dental college.



Courtesy of the National Museum of Dentistry, Baltimore, MD

FIGURE 1-5

Chapin Harris, one of the founders of professional dentistry in America, helped establish the first dental college in the world and the first national association representing dentistry.

Maryland, while concurrently attending medical school. He felt it was important that the field of dentistry require more formal education and scientific research and he is regarded as a leader in establishing a formal system of dental education.

One of the students who studied with Hayden was Chapin A. Harris (1806–1860) (Figure 1-5). Harris believed in education and built an extensive library of dental literature, including his own work, *The Dental Art: A Practical Treatise on Dental Surgery*. Due to the efforts of Hayden and Harris, the first dental college in the world, the Baltimore College of Dental Surgery, was founded on March 6, 1840. It is now called the School of Dentistry at the University of Maryland and is the home of the Dr. Samuel Harris National Museum of Dentistry.

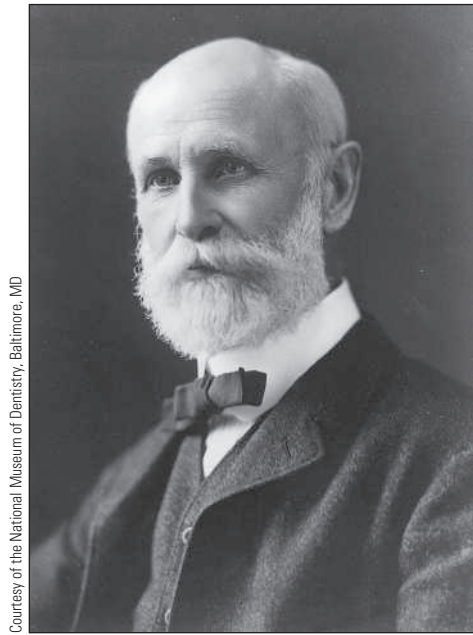
Chapin Harris was a main founder and the first president of the American Society of Dental Surgeons in 1840, which was later to become the American Dental Association. He continued to pursue the advancement of dentistry in the United States until he died in 1844. The efforts of Horace Hayden and Chapin Harris took dentistry out of the association with medicine and hands of **preceptorship** to professional independence and one step closer to the modern world. Harris is considered one of the founding members of the profession of dentistry and a pioneer of dental journalism. He was the founder and chief editor of the first dental periodical, the *American Journal of Dental Science*, and published the first dental dictionary in the English language.

Dr. Samuel D. Harris, after whom the museum was named, was instrumental in founding the museum. It is the largest and most complete museum of dental artifacts and history. Visitors can

learn about the heritage of dentistry and how to maintain their oral health. They can learn if President George Washington's teeth were really made of wood, engage in interactive exhibits, and partake in educational programs.

Dr. Greene Vardiman Black (1836–1915), known as G.V. Black (Figure 1-6), taught in dental schools such as the University of Iowa and the Northwestern University Dental School in Chicago. As the dean, he increased the library holdings and authored more than 500 articles and several books. He invented numerous machines for testing alloys and instruments to refine cavity preparations. Black later enlarged these instruments for demonstrations to students in the classroom. Many refer to him as the "grand old man of dentistry" or as one of the "founders of modern dentistry in the United States." His goal was to make dentistry independent from medicine. He wrote a number of books and articles, coining the term *extension for prevention in cavity preparation*. He conducted vast research, especially in the formulation of silver **amalgam**. His contributions are still being used today in his classification of instruments and restorations. His son, Arthur D. Black, followed in his footsteps, becoming dean of the Northwestern University Dental School in Chicago. In 1921, he developed the *Index to Dental Periodical Literature in the English Language*. Not only did this allow researchers to access the literature, but it also provided access to general practicing dentists who wanted to improve their knowledge and skills.

Lucy Beaman Hobbs Taylor, the first woman to graduate from a recognized dental college, earned her dental degree in 1866 (Figure 1-7). She was a teacher who became interested



Courtesy of the National Museum of Dentistry, Baltimore, MD

FIGURE 1-6

Dr. Greene Vardiman Black (1836–1915), known as the “grand old man of dentistry” or as one of the “founders of modern dentistry in the United States.”



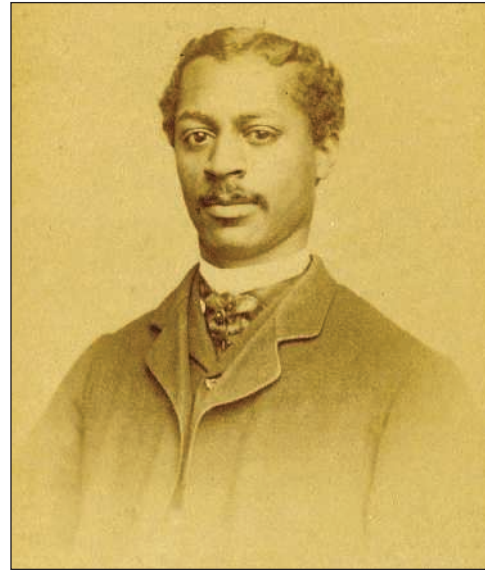
Courtesy of the Kansas State Historical Society

FIGURE 1-7

Lucy Beaman Hobbs Taylor.

in medicine and then pursued further education. She met with resistance, but after the Iowa State Dental Society amended its constitution and bylaws, she was admitted into the dental college.

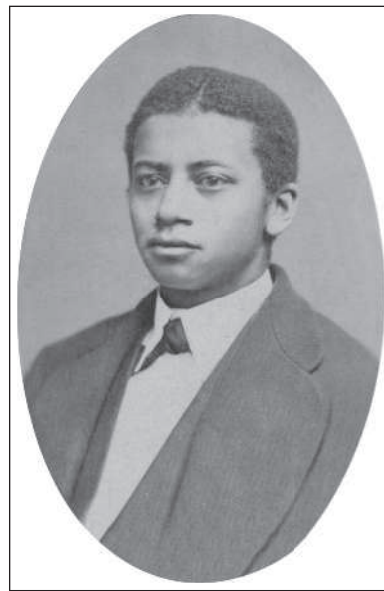
Dr. Robert Tanner Freeman (Figure 1-8), the first African American to earn a dental degree, graduated from Harvard University Dental School in 1869. Eleven years later in 1890, Ida Gray became the first African American woman to earn a dental degree upon graduation from the University of Michigan School of Dentistry. George Franklin Grant (Figure 1-9), an African American,



Courtesy of Harvard University Library

FIGURE 1-8

The first African American to earn a DMD, Dr. Robert Tanner Freeman graduated from the Harvard School of Dental Medicine in 1869.



Courtesy of Harvard University Library

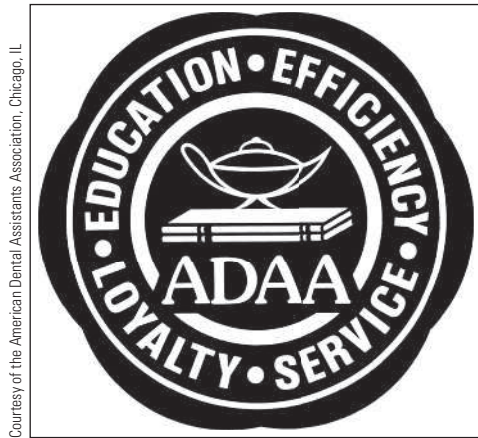
FIGURE 1-9

Dr. George Franklin Grant graduated from the second class of Harvard School of Dental Medicine.

graduated from the second class in dentistry in 1870 at Harvard University. He is credited as an authority on the cleft palate.

American Dental Association

At a time when dentistry education and literature were developing, it was thought that organizing dentists would promote sharing of information concerned with excellence in dentistry. Horace Hayden and Chapin Harris collaborated on endeavors such as forming the first nationwide association of dentists.

**FIGURE 1-10**

Logo for the American Dental Assistants Association.

The American Society of Dental Surgeons was formed in 1840, but was dissolved in 1856. Harris had long believed in the need for an informative dental periodical and was instrumental in its founding in 1839. This journal was called the *American Journal of Dental Science (AJDS)*. Later, in 1859, 25 delegates gathered in Niagara Falls, New York, and organized the American Dental Association (ADA). The association was small at first, but after grouping all local associations according to states and then giving all states representation in the national organization, membership began to increase. Today, each state has its own organization with bylaws approved by the ADA, and each local (regional) organization has ADA-approved bylaws that are sent to each state organization. For example, Texas is represented in the ADA by the Texas State Dental Association, and the Texas State Dental Association comprises individual local dental associations. The official publication of the ADA is the *Journal of the American Dental Association (JADA)*. The ADA also has a website, <https://www.ada.org/en>, which provides a link to the ADA for dental professionals and dental consumers.

Some offices/clinics are hiring a dental assistant called a **sterilization assistant** to do all the disinfecting/sterilizing of treatment rooms and instruments. This individual is responsible for monitoring all sterilizers, water lines, ultrasonic units, cold chemical solutions, and biohazard materials. They stay informed regarding updates on chemicals and the personal protective equipment required when using them.

American Dental Assistants Association The early 1900s became the groundbreaking period of the American dental assistants. The American Dental Assistants Association (ADAA) was founded in 1924 by Juliette Southard, its first president (Figure 1-10 and Figure 1-11). It was founded on four principles: education, efficiency, service, and loyalty. Membership offers a voice in national affairs regarding the career of dental assisting, opportunities in continuing education, professional liability insurance, and interaction with other professionals in the field. ADAA members can remain current in their knowledge through the ADAA publication *The Dental Assistant, Journal of the*

**FIGURE 1-11**

Juliette Southard, founder and first president of the American Dental Assistants Association.

American Dental Assistants Association, or by accessing the ADAA website (<http://www.adaausa.org/>).

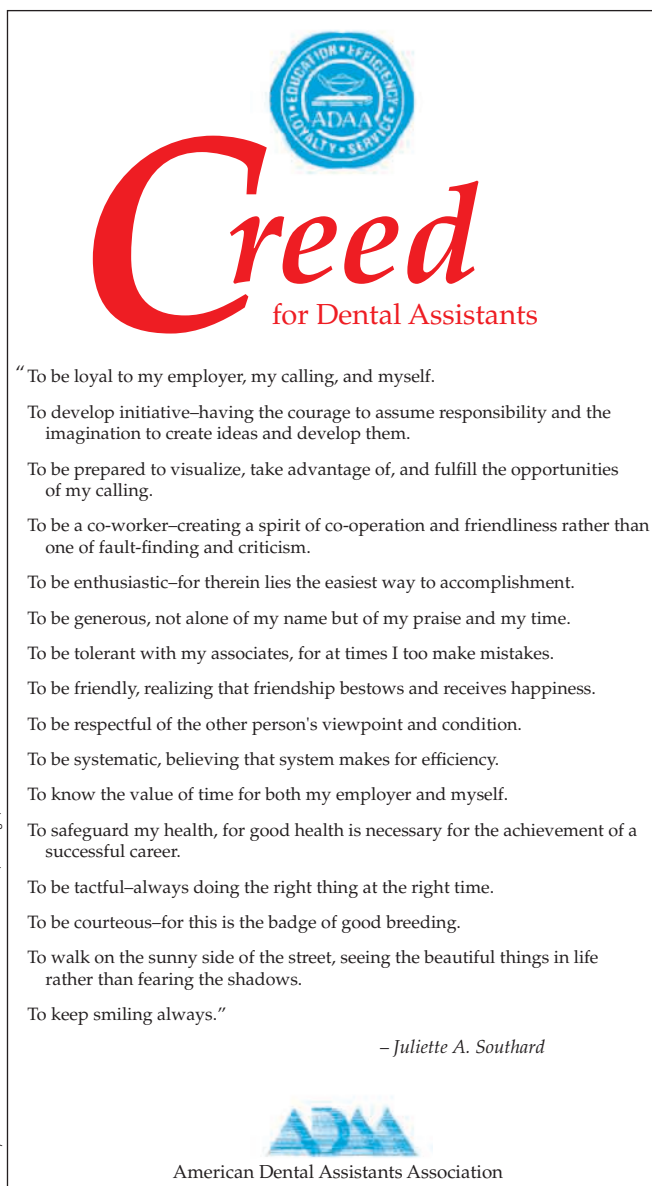
When pursuing a career in dental assisting, it is beneficial to use the “Creed for Dental Assistants” (Figure 1-12) and the “Dental Assistants Pledge” (Figure 1-13) as guidelines for professional behavior.

Advances in Equipment and Pharmaceuticals

During the nineteenth and twentieth centuries, many advances were made in science and technology, some of which were accelerated in the 1930s to help win the Second World War. New ideas, materials, and concepts resulted in the development of new dental techniques, medicines, instruments, equipment, and procedures. By the early 1960s, the practice of dentistry was in transition.

High-Speed Handpiece

Many types of drills, such as the bow drill, were developed over the years, even as far back as during the Mayan civilization. Hand drills with long handles spun by hand were attempted, but they were very cumbersome and inefficient. John Greenwood even attempted to construct a dental engine in the 1790s. The first foot treadle dental engine was developed by James Morrison. He received a patent for the machine in 1871. By the late 1800s, electricity was developed and the electric drill was invented. By 1915, the foot treadle drill was being surpassed by an early version of the electric drill.

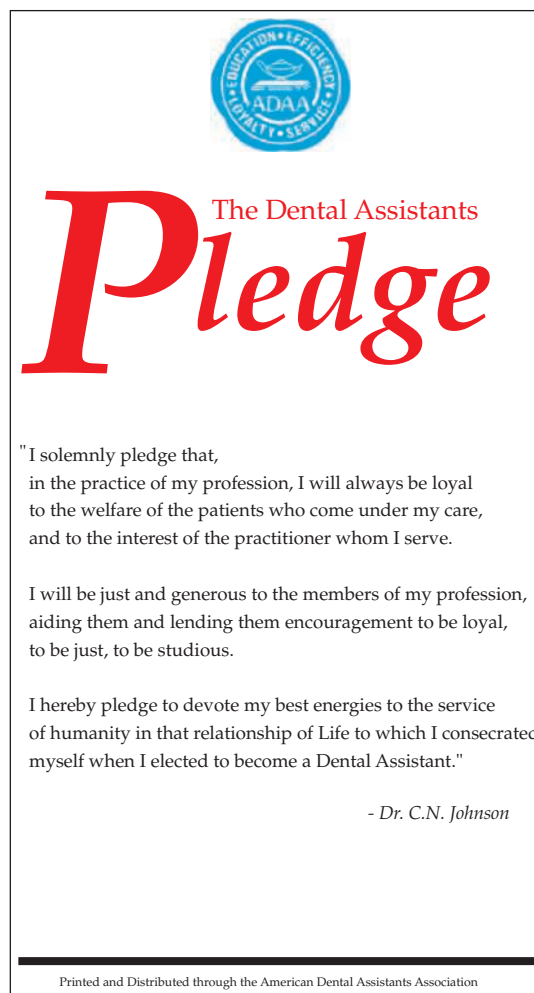
**FIGURE 1-12**

The "Creed for Dental Assistants" by Juliette A. Southard.

A number of other prototypes were developed, but none compared to the Airotor **handpiece** developed by John Borden in 1957. The Airotor high-speed handpiece had rotational speeds up to 200,000 rpm (rotations per minute) and operated by air compression. This allowed the dentist to provide a more detailed, accurate preparation of a tooth for a restoration. This method was much safer and quicker. Newer versions of the high-speed handpiece now surpass speeds over 300,000 rpm.

Sit-Down Dentistry

Originally dentists worked standing up with the patient in an upright position. This was difficult and uncomfortable for the dentist and the assistant. With the use of the high-speed handpieces and their attachments, dentists began sitting down on stools and placing the patient into a reclined position. In the

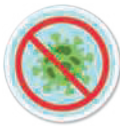
**FIGURE 1-13**

"The Dental Assistants Pledge" by Dr. C. N. Johnson.

early 1960s, new delivery systems and cabinetry were designed to accommodate sit-down dentistry. Dentists began four-handed dentistry, but it was several years before this became standard.

Infection Control and Prevention

Can you imagine not washing your hands before performing surgery? Up until the 1850s, physicians and dentists did not wash their hands prior to surgery. In the late 1840s, the need for health care workers to participate in routine handwashing to prevent the spread of infectious disease was finally explored. Dr. Ignaz Semmelweis, a Vienna physician, recognized that maternity patients were dying at an alarming rate from hospital deliveries. He researched and demonstrated that routine handwashing could prevent the spread of disease. Dr. Semmelweis later discovered that disinfecting hands could further decrease the spread of disease for maternity patients. In 1847, he had all medical students wash their hands with chlorinated lime before assisting in deliveries. Oliver Wendell Holmes Sr. made similar discoveries in early 1837. He wrote about the moral obligation of physicians to purify their instruments to prevent the spread of contagious diseases, a practice his peers ridiculed.



Infection control and prevention were introduced to health care in England by Florence Nightingale (1820–1910), an English nurse. Although she did not have a scientific understanding of disease transmission, her research into hospital sanitary problems during the Crimean War (1853–1856) made her a believer in the need for pure air, pure water, and cleanliness. She was born into a rich upper-class, well-connected family with a lot of influence. With this influence, she was able to formalize standard cleanliness and sanitation in hospitals and the military.

There were no standards for infection control in health care until 1867 when Joseph Lister advocated disinfection with chemicals. He reasoned that Louis Pasteur's "germ theory" introduced in 1861 may also infect wounds, so he introduced disinfection in the operating rooms and gloves to prevent dermatitis from the disinfecting solutions. Up until then it was common practice that most dental instruments only had to be as clean as knives and forks. Dentists sterilized their needles and surgical instruments in boiling water. The primary means of disinfection by chemicals continued into the 1950s. The early 1960s was a new era of sterility as the use of sterilizers increased and cold disinfectants became commonplace. Infection control was not upgraded for more than a decade when the CDC began infection control training in the 1970s. The mission of the CDC expanded in the 1970s from a center of **epidemiology** to include the application of principles to prevent and control the spread of infection. The name was changed from Communicable Disease Center to Centers for Disease Control. In 1987, universal precautions were developed by the CDC to prevent the transmission of bloodborne infectious disease. The CDC published guidelines that included the use of protective barriers such as gloves, protective clothing, eyewear, and masks.

Up until the early 1980s, dentists did not routinely wear gloves while working in the patient's mouth despite the direct contact with blood. In 1988, the CDC recommended specific infection control practices for dentistry. Congress directed the Occupational Safety and Health Administration (OSHA) to finalize the **Bloodborne Pathogens Standard** by 1991 to protect the nation's health care workers from exposure to infectious pathogens. The standard included an exposure control plan and the use of personal protective equipment (PPE). Dental health care workers now wash their hands between patients and the use of gloves, eyes protection, protective clothing, and surgical masks has become the standard.

Nitrous Oxide

Pain during dental procedures deterred many patients from receiving any type of dental treatment. Dentists were searching for something to relieve that pain and make the patients less

anxious. In 1844, Horace Wells, a dentist, heard a lecture on the effects of nitrous oxide. He learned that a patient under the influence of nitrous oxide did not remember being injured or the pain involved with the injury. Wells had the revelation that nitrous oxide could be used effectively for dental treatment. In order to research the use of nitrous oxide, Wells allowed his preceptor dentist to remove one of his teeth. Wells felt no pain from the procedure. With this discovery, the use of nitrous oxide was inducted into dental treatment. Nitrous oxide is still commonly used today to reduce patient anxiety associated with dental care.

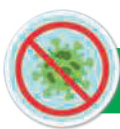
Local Anesthesia

Nitrous oxide was a major advancement in making patients more comfortable during dental treatment, but some type of localized medicine was still being sought. In 1884, the **analgesic** property of cocaine was discovered by Carl Koller, an ophthalmic surgeon. Cocaine is highly addictive and ultimately was not the best product to use. In 1904, the synthetic analgesic *procaine* (Novocaine®) was developed in Germany. By 1950, an even safer version of analgesic, *lidocaine* (Xylocaine®), was introduced. Lidocaine was much safer than Novocaine and became the analgesic of choice for dentists. Lidocaine is currently the most commonly used local anesthetic.

Advances in Imaging

Although not a dentist, Wilhelm Conrad Roentgen was another great contributor to the dental field (Figure 1-14). Trained in the field of mechanical engineering, Roentgen later became a faculty member teaching physics. In 1895, he performed an experiment by passing an electrical current through gas in a tube. Roentgen discovered that by working in darkness and not allowing light in the tube, the rays coming out the other end would leave an image on paper plating. He placed a photographic plate with his wife's hand on the area and found that the rays permeated her soft tissues, leaving an outline of her skeletal bones and ring on the plate. The name of *x-ray* was given because the makeup of these rays was unknown.

Dr. C. Edmund Kells has been given credit for utilizing x-rays in the dental field after reading Roentgen's works. Kells developed a film and holder to fit in the patient's mouth. Even though the process of taking an intraoral dental film took 15 minutes and was tedious, the use of dental x-rays was born in 1895. Dental x-rays allowed the dentist to view inside the hard tissues of the mouth on a **radiograph**. This allowed dentists to see areas of decay and bone loss that was not visible before. The amount of radiation, speed of the dental film, and technique for traditional x-rays have evolved and improved and



Infection Control

At a minimum the CDC recommended that, "gloves must be used where there is reasonable anticipation of employee hand contact with blood or other potentially infectious materials (OPIM), or non-intact skin (MMWR, 1988; 37:379). OSHA used the research of the CDC in developing it Bloodborne Pathogen Standard.