English

for the Students of

Dentistry

Volume 1

By:

Jafar Zarghami

Sara Heidari Foroushani

Mojtaba Moayedfar

سرشناسه	:	Jafar Zarghami
عنوان و نام پدیدآور	:	English for the Students of Dentistry (Volume 1)، Jafar Zarghami , Sara Heidari Foroushani , Mojtaba Moayedfar
مشخصات نشر	:	تهران : شایان نمودار ، ۱۴۰۱.
مشخصات ظاهری	:	۱۲۳ ص.
شابک	:	۹۷۸-۹۶۴-۲۳۷-۷۰۰-۸
وضعیت فهرست نویسی	:	فیپا
موضوع	:	زبان انگلیسی -- دندانپزشکی
شناسه افزوده	:	Sara Heidari Foroushani , Mojtaba Moayedfar
رده بندی کنگره	:	PE ۱۱۲۷/د۹ ب۴ ۱۴۰۱
رده بندی دیویی	:	۴۲۸
شماره کتابشناسی ملی	:	۲۲۹۵۴۶۰

نام کتاب: English for the Students of Dentistry (Volume 1)

گردآوری و تألیف: Jafar Zarghami , Sara Heidari Foroushani , Mojtaba Moayedfar

ناشر: انتشارات شایان نمودار

مدیرتولید: مهندس علی خزعلی

حروف چینی و صفحه آرایی: انتشارات شایان نمودار

طرح جلد : آتلیه طراحی شایان نمودار

نوبت چاپ: اول

شمارگان: ۵۰۰ جلد

تاریخ چاپ: بهار ۱۴۰۲

شابک: ۹۷۸-۹۶۴-۲۳۷-۷۰۰-۸

قیمت: ۱،۲۰۰،۰۰۰ ریال

شایان نمودار

دفتر مرکزی: تهران/ میدان فاطمی/ خیابان چهلستون/ خیابان دوم/ پلاک ۵۰/ بلوک B/ طبقه همکف/ تلفن: ۸۸۹۸۸۸۶۸

وب سایت: shayannemoodar.com

اینستاگرام: Shayannemoodar

Contents

Preface

Nowadays, competence in English has become an urgent need for dental students who are involved in medical services. It is due to the fact that they are required to have the ability to communicate with the other people in their field including other doctors and patients.

English for dental students volume 1 is prepared for the demands of professional dentistry also include English competence. This book provides students to improve their English skills.

The contents of this volume are based on dental knowledge.

Procedures taught in previous year, so that the contents are not something strange for students.

This course volume is certainly help to facilitate the student to acquire the ability to perform their duties in an environment where English is used and needed. I wish that this book will be studied and practiced easily to achieve the competence of dental English.

I hope that by the use of this volume, the dental students will be able to learn and practice English according to their professional skills. By mastering English for dental students volume 1, it will improve their quality of human resources and they will have added value so that job opportunities will be widely open for them to reach a bright future.

Authors

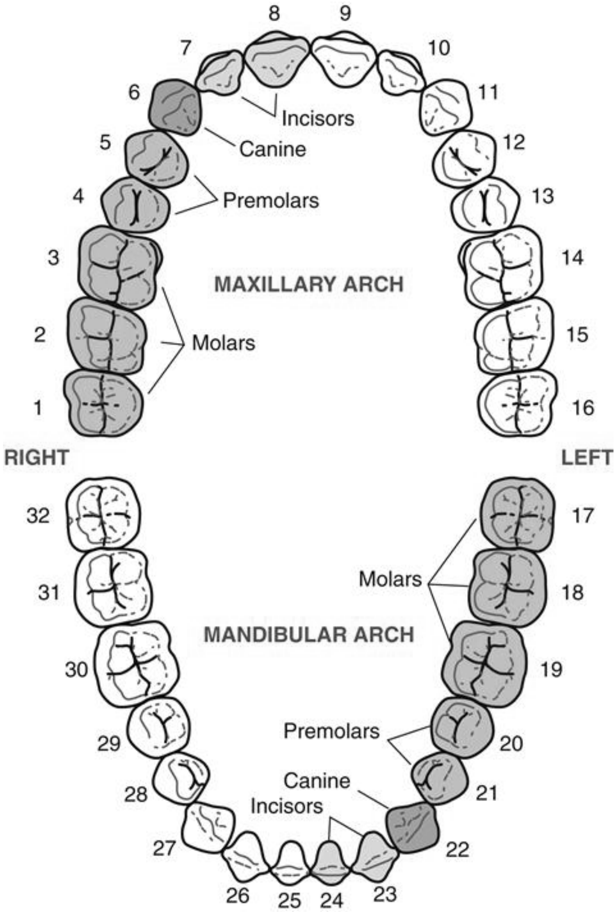
Mojtaba Moayedfar

Jafar Zarghami

Sara Heidari Foroushani

Unit 1

Human Dentition



The Human Dentition

Teeth are highly mineralised structures retained in the alveoli sockets situated in the alveolar process of the jaws (maxilla and mandible) - by means of the periodontal ligament, a fibre called the periodontium.

Like all mammals, humans are provided with two sets of teeth: the primary or 'deciduous' dentition, the so-called 'milk teeth and the secondary or permanent dentition.

The primary dentition consists of 20 elements belonging to three morphological classes: 8 incisors, four canines, and eight molars. In modern humans, dental eruption starts at about the age of 6 months and ends at about the age of 3 years.

The secondary dentition consists of 32 teeth belonging to four morphological classes: 8 incisors, four canines, eight premolars, and 12 molars.

The dental formula is a system for summarising the number of each type of tooth (incisor, canine, premolar, molar) in each quadrant of the mouth. Dental formulae show variation between species and may be different for the maxillary and mandibular dentition. For example, the dental formula for a dog is 3142/3143 (upper/lower dentition), indicating that there is an additional molar in the mandible. In humans, the deciduous dentition consists of 20 teeth, with the dental formula 2102/2102 indicating two incisors, one canine, zero premolars, and two molars in each quadrant. The permanent dentition consists of 32 teeth in total, with the dental formula 2123/2123 indicating two incisors, one canine, two premolars, and three molars in each quadrant.

Each tooth presents a buccal surface facing towards the cheek, a lingual one adjacent to the tongue, a mesial (anterior), and a distal (posterior) surface. The chewing/tearing surface of the crown coincides with the occlusal plane. Interproximal tooth surfaces contact adjacent teeth, and the tooth roots are suspended in sockets (alveoli) in the mandible and maxillae by periodontal ligaments.

Eruption starts at about the age of 6-7 years and ends at about 11-13 years, with the exception of the third permanent molar, which erupts at about 17-24 years. For both the primary and secondary dentition, a considerable range of variation exists among living humans in the timing of eruption.

From the age of 6 years, after the resorption of the deciduous roots, the secondary dentition begins to replace the primary teeth. Twenty of the permanent teeth develop under their deciduous counterparts. The permanent molars, located behind the deciduous dentition, cannot erupt until the jaws are large enough to accommodate them. Thus, the permanent dentition consists of 20 successional teeth (incisors, canines and premolars) and 12 accessional teeth (molars). From a biogenetic point of view, the accessional teeth belong to the primary dentition (having no predecessors). During the period between the eruption of the first permanent tooth, usually a lower first molar, and the loss of the last deciduous tooth, usually, a second molar, making way for the permanent second premolar, the dentition is mixed.

With respect to their arrangement within the dental arch, teeth are classified as anterior (incisors) and posterior (premolars and molars). Due to their position and shape, the canines belong to both groups.

Shape and function are strongly correlated in the teeth. The anterior teeth are 'designed' for tearing, while the posterior multi-cuspal teeth are shaped for chewing. Incisors are single-rooted teeth with cutting edge. Canines, sometimes called eye teeth, are single-cusped teeth with a relatively long root and a cingulum which is a bulge or ridge found on the palatal or lingual aspects of incisor and canine teeth near their cervical margin. Premolars or bicuspids normally have two cusps and one or two roots of similar size, which are flattened mesiodistally. Molars commonly have 3-5 cusps and 2-3 roots. The distal most (third) molars are sometimes called *wisdom teeth* and are among the most variably present teeth in the human dentition.

The external appearance of each tooth presents two main elements: the crown and the root or roots, which are linked/separated by a constricted transitional portion, the neck.

The *crown* is the portion of the tooth that lies above the gum line, typically the visible portion in the mouth, and the *root* is the portion below the gum line that anchors the tooth in the alveolus. Like bone, teeth are composed of calcified tissue, though it differs somewhat from the bone. Teeth contain three different tissue types. Enamel covers the external surface of the *crown* and is the hardest tissue on the body. Enamel contains no living cells and has no blood supply. Cementum covers the external surface of the roots. Underlying these surface layers, there is a very tough resilient tissue, the dentine, protecting the pulp chamber. This chamber contains the nerves, blood vessels, and fibrous connective tissues that communicate with nerves and vessels in the jaws through a foramen located at the base of the root. The function of the pulp tissue is to feed the tooth for its entire life.

Enamel is a highly calcified tissue of ectodermal origin. It is composed of millions of closely packed calcified prisms, each extending from the inner to outer surface of the dentine. Deposition of the enamel matrix by the ameloblasts which are ectodermally derived cells primarily responsible for the formation of enamel, starts from the tip of the cusp towards the neck, and outwards from the dentin-enameljunction until the full thickness of enamel over dentine is complete. The enamel formation process is called amelogenesis.

Dentine is also a calcified tissue, but even though it is harder than bone tissue, it has only about one-fifth of the hardness of enamel. It is composed of a huge number of S-shaped tubules named the dental canaliculi, which are formed by odontoblasts. Its elastic properties, such as the ability to deform when forces are applied, support the much more brittle enamel and make it more challenging to break because of this cushioning effect. Unlike amelogenesis, dentinogenesis continues throughout the lifetime of the tooth and proceeds towards the pulp cavity, which decreases progressively in size.

Cementum is a non-homogeneous connective mineralised tissue and some forms of cellular cementum are closely related to bone. It anchors the collagen fibre bundles of the periodontal ligament to the root surface, and also carries out adaptive and reparative processes. Several types of cells derived from the ectomesenchyme, such as cementoblasts, cementocytes, and fibroblasts, are responsible for its development. A portion of cementum is formed pre-eruptively during root development, while other portions form progressively during and after tooth eruption. As long as a functioning periodontal ligament is present, the cementum continues depositing different ringlike layers called annulations in a roughly annual rhythm.

Dental Eruption

Mammalian teeth may vary in shape and function along the tooth row (e.g., incisor, molar), but nonmammalian dentitions tend to be homodont such as each tooth is the same shape in a row; tooth shape may differ across rows. Nonmammalian teeth are replaced *de novo* throughout life via various mechanisms, but most mammals have lost this regenerative ability. For example, humans replace each tooth only once and mice never replace their teeth.

Mammalian and nonmammalian dentitions differ in at least one other important aspect. In mammals, teeth are confined to a single row on the oral jaw, and taste buds are located separately on the tongue and palate. In other vertebrate groups, including bony and cartilaginous fishes, teeth and taste buds are often colocalized on jaw elements.

Teeth develop in a process called odontogenesis within the jaws, in alveolar pockets called *crypts*. Teeth develop from the crown toward the root. When the crown is complete, the developing tooth will erupt or move into its occlusal position in the mouth. During childhood, the deciduous dentition is shed and replaced by the permanent dentition. The eruption and shedding of the deciduous dentition are important for proper growth and space allocation for the permanent dentition, and the sequence of dental development and eruption is often used in the process of aging subadult individuals.

In human embryos, odontogenesis begins approximately 28 to 40 days after fertilisation and goes on until about 18 to 25 years of age. The deciduous tooth germs start development from the beginning of the 8th week and continue until the 17th week after fertilisation. During this period, the tooth germs develop from initial cell clusters through three stages: the bud, cap, and bell stages. The bud and cap stages correspond to morphogenesis, while dental histodifferentiation takes place during the bell stage.

At the same time, the epithelial structure, the enamel organ, is developing, together with the dental papilla and the dental sac. All these structures are components of the tooth germ.

The bud stage is reached by the germs of the anterior teeth at the end of the 7th week after fertilisation, by those of the first molars in the 8th week, and by those of the second molars in the 10th week. The tooth bud consists of a vestibular-directed outgrowth and a thickening of the epithelial cell cluster.

The cap stage is reached between the 8th and 12th week after fertilisation. During this stage, the spatial relationship of the enamel organ changes with respect to the dental lamina. The cells of the enamel organ begin to arrange themselves into structurally differentiated layers simultaneously.

The anterior teeth are the first to reach the bell stage at 12 to 16 weeks after fertilisation, while the deciduous molars reach the bell stage between the 15th and the 21st week. During this time, the enamel organ assumes a shape appropriate to the various crown forms.

Lacking deciduous predecessors, the three molars of the secondary dentition arise posterior to the deciduous dentition, starting with the first molar about the 13th week after fertilisation. They originate from a distal extension of the deciduous dental lamina.

The successional teeth arise lingually to the deciduous teeth. Their germs grow and differentiate just like those of the deciduous teeth and the permanent molars, but their development extends over a broader span of time. This process begins during the 5th month after fertilisation with the formation of buds for central incisors, and ends at the age of 2-3 years with the beginning of the formation of dental hard substance in second premolar.

The absence or agenesis of the third molar is a well-documented phenomenon, with most people exhibiting absence, impaction, or malposition of the third molars. It is also related to agenesis and reduction of the size of other molars and other teeth. Third molar agenesis has been noted to be related to craniofacial morphology and is evolutionarily hypothesized to be related to an overall reduction in jaw length and accompanying increase in brain size, with less reliance on the teeth for subsistence and survival.

Dental Nomenclature Systems

The positions of all teeth are indicated by numbers, referring to the position that the tooth holds in the tooth row. Globally, there are several different tooth numbering systems. Some commonly used systems are the Zsigmondy-Palmer system, Universal Numbering System, and the FDI numbering system. Among these systems, the Zsigmondy-Palmer system is the oldest and by far the most widely used.

Zsigmondy-Palmer system

It was originally termed the “Zsigmondy system” after the Hungarian dentist Adolf Zsigmondy who developed the idea in 1861, using a Zsigmondy cross to record quadrants of tooth positions. The Palmer notation consists of a symbol (┘└┐┌) designating in which quadrant the tooth is found and a number indicating the position from the midline. Adult teeth were numbered 1 to 8, and the child’s primary dentition was depicted with a quadrant grid using Roman numerals I, II, III, IV, and V to number the teeth from the midline distally. After that, Palmer changed this to A, B, C, D, E.

There are several systems in use in the world, but only a few are considered. In 1947, a committee of the American Dental Association recommended the symbolic Zsigmondy/Palmer system as the numbering method of choice. However, in 1968, the ADA officially recommended the “universal” numbering system, due to difficulties with the keyboard notation of the symbolic Zsigmondy/Palmer notation system.

Universal Numbering System

The Universal Numbering System, proposed by German dentist Julius Parreidt in 1882, uses consecutive integers, beginning with the upper right third molar, designated as #1, and counts clockwise around the dentition, finishing with the lower right third molar designated as #32. The primary dentition is identified by the letters of the alphabet, A-T.

FDI Numbering System

It is a two-digit system proposed by Fédération Dentaire Internationale (FDI) for both the primary and permanent dentitions. It is also known as ISO 3950 notation system. This system has been adopted by the World Health Organization “WHO” and accepted by other organisations, such International Association for Dental Research. In this system, the first number represents a tooth’s quadrant, and the second number represents the number of the tooth from the midline of the face. For permanent teeth, the upper right teeth begin with the number “1”. The upper left teeth begin with the number “2”. The lower left teeth begin with the number “3”. The lower right teeth begin with the number “4”. For primary teeth, the sequence of numbers goes 5, 6, 7, and 8 for the teeth in the upper right, upper left, lower left, and lower right respectively. For example: deciduous molar tooth in the lower right jaw, position 5, would be noted as 85.

Gene Expression and Dental Development

Each human tooth has a distinctive morphology and each type of tooth forms in a characteristic location. For many years, virtually nothing was known about the patterning of the dentition, but analysis of certain types of genetically modified mice has provided concrete clues to the molecular basis of dental patterning. Both the dental field overall and the patterning of the dentition take shape very early in craniofacial development, before any overt indication of tooth formation. The expression of Pitx-2 (bicoid-related transcription factor; outlines first the entire ectodermal dental field and later the epithelium of the individual tooth germs. The patterning of teeth within the dental epithelium occurs through mutually antagonistic interactions between FGF-8 and BMP-4. The former is the actual inductive signal for the initiation of tooth development, and its action results in the expression of Pax-9 at the sites where individual teeth will form.

The homeobox-containing genes *Dlx-1* and *Dlx-2* are expressed in the maxillary arch and in the proximal part of the mandibular arch. When both these genes are knocked out in mice, the upper jaw develops without molar teeth, although molars develop in the lower jaws. The incisor teeth in both jaws develop normally. Another homeobox-containing gene, Barx-1, is induced by FGF-8 in the proximal ectoderm of the mandibular process, and in the formation of molar teeth in knockouts, it may compensate for the absence of Dlx-1 and Dlx-2 in the lower jaw. FGF-8 acts proximally to restrict Barx-1 and Dlx-2 to the molar-producing domain, and BMP-4 acts distally to activate Msx-1 and Msx-2 in guiding the formation of incisor teeth.

Not only the location but also the type of tooth is under tight developmental control. The difference in morphology between an incisor tooth, possessing a single cusp, and a molar tooth, which contains several cusps, is related to the number of enamel knots in the developing tooth. A striking example of the molecular control of dental patterning is the conversion of incisor teeth to molars in mice. In the distal part of the mandibular arch, ectodermal BMP-4 signals normally repress the expression of*Barx-1*, but when BMP-4 signalling is inhibited by the implantation of noggin beads, Barx-1 expression is induced in the dental mesenchyme, and the developing incisor teeth are transformed into molars. The transcription factor Islet-1 is expressed only in the oral surface ectoderm in the area where incisors will form. In contrast, Pitx-1 is expressed only in the molar region of the mandibular mesenchyme where it acts upstream of*Barx-1*.

Mammals have only a single row of teeth in each jaw. This is controlled by two overlapping gradients of opposite polarity along the lingual–buccal axis. On the buccal side of the jaw, a high concentration of BMP-4 stimulates the expression of Msx-1 in the dental mesenchyme in the normal process of tooth development, thus accounting for the development of the normal teeth. On the lingual side of the jaw, a high concentration of the transcription factor Osr-2 inhibits the BMP-Msx axis and, consequently, tooth formation in that area. When Osr-2 is inactivated, BMP-4–Msx-1 activity on the lingual side of the jaw is not inhibited, and supernumerary teeth form on the lingual side of the normal row of teeth. Enhancing or inhibiting the function of many of the other genes involved in tooth development can also lead to the formation of supernumerary teeth, but these genes do not cause expansion of the entire dental field, as does *Osr-2*.

Comprehension Questions

Answer the following questions according to the text you read.

1. What is a dental formula?
2. How many cusps and roots does a molar commonly have?
3. What is the function of the anterior and posterior teeth?

Fill in the Blanks!!!

Fill in the blanks with appropriate words from the list below.

Crown, enamel, alveolus, cementum, dentin-enamel junction, odontogenesis, root

1. Due to the position and shape of teeth -------- belong to both groups.
2. ---------- is a calcified tissue but even though it is harder than bone tissue.

3. Tooth develops in a process called --------- within the jaws.

4. Teeth develop from the -------- toward the-------.

Matching

Match the definitions in column 1 with the words in column 2.

Dentine Universal numbering system

Cementum FDI numbering system

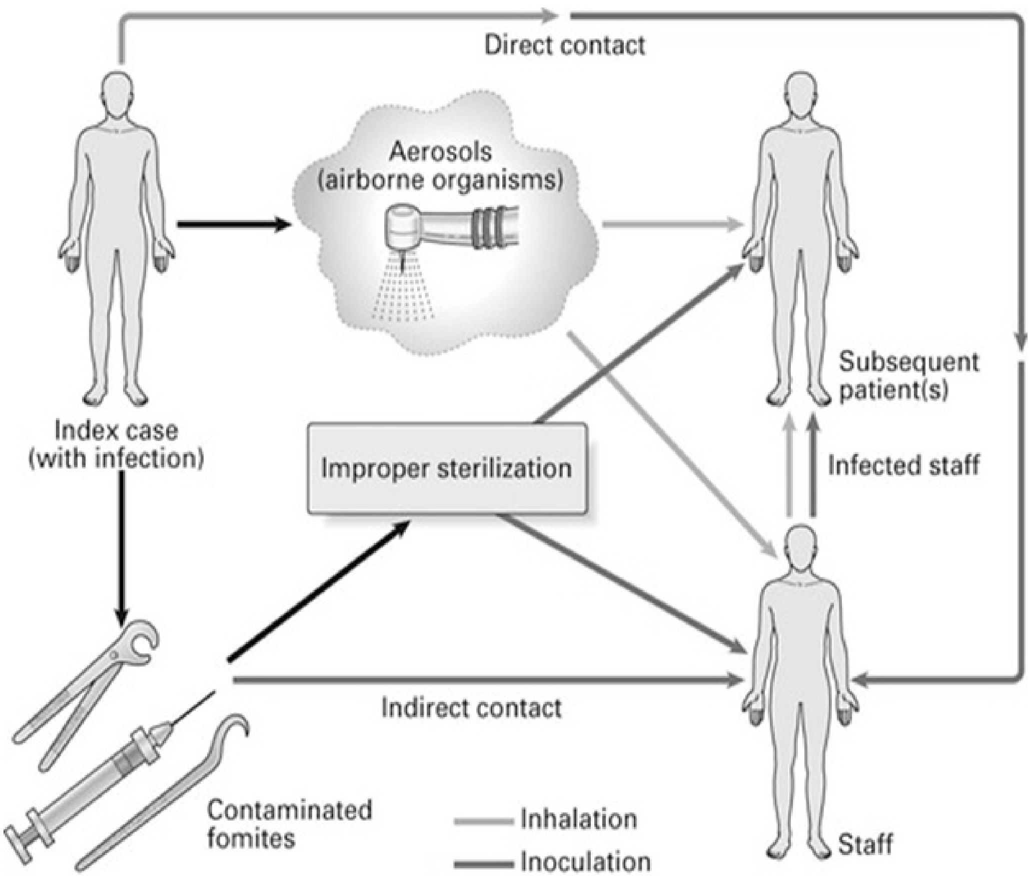
Annulations Calcified tissue

Federation dentaire international is Closely related to bone

Julius parreidt

Unit 2

Cross Infection



Cross Infection Control in Dental Practice:

Administrative Measures Infection prevention must be made a priority in any dental health care setting with at least one individual with training in infection prevention.

The infection prevention coordinator should be responsible for developing written infection prevention policies and procedures based on evidence-based guidelines, regulations, or standards. Policies and procedures should be tailored to the dental setting and reassessed on a regular basis (e.g., annually) or according to state or federal requirements.

Development should take into consideration the types of services provided by DHCP and the patient population served, extending beyond the Occupational Safety and Health Administration (OSHA) bloodborne pathogens standard to address patient safety.

The infection prevention coordinator should ensure that equipment and supplies (e.g., hand hygiene products, safer devices to reduce percutaneous injuries, and personal protective equipment) are available and should maintain communication with all staff members to address specific issues or concerns related to infection prevention.

In addition, all dental settings should have policies and protocols for the early detection and management of potentially infectious persons at the initial points of the patient encounter.

Key Administrative Recommendations for Dental Settings:

1. Develop and maintain infection prevention and occupational health programs.
2. Provide supplies necessary for adherence to Standard Precautions (e.g., hand hygiene products, safer devices to reduce percutaneous injuries, and personal protective equipment).
3. Assign at least one individual trained in infection prevention responsibility for coordinating the program.
4. Develop and maintain written infection prevention policies and procedures appropriate for the services provided by the facility and based on evidence-based guidelines, regulations, or standards.
5. Facility has a system for early detection and management of potentially infectious persons at the initial points of the patient encounter.

Infection Prevention Education and Training Ongoing education and training of DHCP are critical for ensuring that infection prevention policies and procedures are understood and followed. Education on the basic principles and practices for preventing the spread of infections should be provided to all DHCP. Training should include both:

- DHCP safety (e.g., OSHA bloodborne pathogens training)

-Patient safety (e.g., emphasising job- or task-specific needs).

Education and training should be provided during orientation to the setting, when new tasks or procedures are introduced and at a minimum, annually. Training records should be maintained according to state and federal requirements.

5 Key Recommendations for Education and Training in Dental Settings:

1. Provide job- or task-specific infection prevention education and training to all DHCP. This includes those employed by outside agencies and available by contract or on a volunteer basis to the facility.

2. Provide training on principles of both DHCP safety and patient safety.

3. Provide training during orientation and at regular intervals (e.g., annually).

4. Maintain training records according to state and federal requirements.

5. Dental Health Care Personnel Safety Infection prevention programs should also address occupational health needs, including vaccination of DHCP, management of exposures or infections in personnel requiring post-exposure prophylaxis or work restrictions, and compliance with OSHA bloodborne pathogens standards.

Referral arrangements for medical services can be made with qualified healthcare professionals in an occupational health program of a hospital, with educational institutions, or healthcare facilities that offer personnel health services.

Immunisation ***of Health-Care Personnel:***

Recommendations of the Advisory Committee on Immunization Practices (ACIP) and OSHA Bloodborne Pathogens and Needlestick Prevention. Critical Recommendations for Dental Health Care Personnel Safety:

- Current CDC recommendations for immunisations, evaluation, and follow-up are available. There is a written policy regarding immunising DHCP, including a list of all required and recommended immunisations for DHCP (e.g., hepatitis B, MMR (measles, mumps, and rubella) varicella (chickenpox), Tdap (tetanus, diphtheria, pertussis).

- All DHCP are screened for tuberculosis (TB) upon hire regardless of the risk classification of the setting.

- Referral arrangements are in place to qualified health care professionals (e.g., occupational health program of a hospital, educational institutions, health care facilities that offer personnel health services) to ensure prompt and appropriate provision of preventive services, occupationally related medical services, and postexposure management with medical follow-up.

- Facility has well-defined policies concerning contact of personnel with patients when personnel have potentially transmissible conditions

Program Evaluation

A successful infection prevention program depends on the following:

-Developing standard operating procedures.

- Evaluating practices and providing feedback to DHCP.

-Routinely documenting adverse outcomes (e.g., occupational exposures to blood) and work-related illnesses in DHCP.

- Monitoring healthcare-associated infections in patients.

Strategies and tools to evaluate the infection prevention program can include periodic observational assessments, checklists to document procedures, and routine reviews of occupational exposures to bloodborne pathogens. The Infection Prevention Checklist for Dental Settings found in Appendix A is one tool DHCP can use to evaluate their infection prevention program.

Evaluation offers an opportunity to improve the effectiveness of the infection-prevention program and dental practice protocols. If deficiencies or problems in the implementation of infection prevention procedures are identified—further evaluation and feedback, corrective action, and training (if applicable) are needed to eliminate the problems.

Key Recommendation for Program Evaluation in Dental Settings:

Establish routine evaluation of the infection prevention program, including evaluation of DHCP adherence to infection prevention practices. Standard Precautions are the minimum infection prevention practices that apply to all patient care, regardless of the suspected or confirmed infection status of the patient, in any setting where health care is delivered.

These practices are designed to both protect DHCP and prevent DHCP from spreading infections among patients. Standard Precautions include:

- Hand hygiene.
- Use of personal protective equipment (e.g., gloves, masks, eyewear).
- Respiratory hygiene/cough etiquette.
- Sharps safety (engineering and work practice controls).
- Safe injection practices (i.e., an aseptic technique for parenteral medications).
- Sterile instruments and devices.
- Clean and disinfected environmental surfaces.

Each element of Standard Precautions is described in the following sections.

Education and training are critical elements of Standard Precautions because they help DHCP make appropriate decisions and comply with recommended practices. When Standard Precautions alone cannot prevent transmission, they are supplemented with Transmission-Based Precautions.

This second tier of infection prevention is used when patients have diseases that can spread through contact, droplet or airborne routes (e.g., skin contact, sneezing, coughing) and are always used in addition to Standard Precautions. Dental settings are not typically designed to carry out all of the Transmission-Based Precautions (e.g., Airborne Precautions for patients with suspected tuberculosis, measles, or chickenpox) that are recommended for hospital and other ambulatory care settings.

Patients, however, do not usually seek routine dental outpatient care when acutely ill with diseases requiring Transmission-Based Precautions. Nonetheless, DHCP should develop and carry out systems for the early detection and management of 7 potentially