NONRESIDENT TRAINING COURSE

October 1999

Dental Technician, Volume 2

NAVEDTRA 14275

Although the words "he," "him," and "his" are used sparingly in this course to enhance communication, they are not intended to be gender driven or to affront or discriminate against anyone.

PREFACE

By enrolling in this self-study course, you have demonstrated a desire to improve yourself and the Navy. Remember, however, this self-study course is only one part of the total Navy training program. Practical experience, schools, selected reading, and your desire to succeed are also necessary to successfully round out a fully meaningful training program.

THE COURSE: This self-study course is organized into subject matter areas, each containing learning objectives to help you determine what you should learn along with text and illustrations to help you understand the information. The subject matter reflects day-to-day requirements and experiences of personnel in the rating or skill area. It also reflects guidance provided by Enlisted Community Managers (ECMs) and other senior personnel, technical references, instructions, etc., and either the occupational or naval standards, which are listed in the *Manual of Navy Enlisted Manpower Personnel Classifications and Occupational Standards*, NAVPERS 18068.

THE QUESTIONS: The questions that appear in this course are designed to help you understand the material in the text.

VALUE: In completing this course, you will improve your military and professional knowledge, Importantly, it can also help you study for the Navy-wide advancement in rate examination. If you are studying and discover a reference in the text to another publication for further information, look it up.

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Published by
NAVAL EDUCATION AND TRAINING
PROFESSIONAL DEVELOPMENT
AND TECHNOLOGY CENTER

NAVSUP Logistics Tracking Number
0504-LP-026-9060

Sailor's Creed

"I am a United States Sailor.

I will support and defend the Constitution of the United States of America and I will obey the orders of those appointed over me.

I represent the fighting spirit of the Navy and those who have gone before me to defend freedom and democracy around the world.

I proudly serve my country's Navy combat team with honor, courage and commitment.

I am committed to excellence and the fair treatment of all."

CONTENTS

The Nonresident Training Course (NRTC) follows the Index

INSTRUCTIONS FOR TAKING THE COURSE

ASSIGNMENTS

The text pages that you are to study are listed at the beginning of each assignment. Study these pages carefully before attempting to answer the questions. Pay close attention to tables and illustrations and read the learning objectives. The learning objectives state what you should be able to do after studying the material. Answering the questions correctly helps you accomplish the objectives.

SELECTING YOUR ANSWERS

Read each question carefully, then select the BEST answer. You may refer freely to the text. The answers must be the result of your own work and decisions. You are prohibited from referring to or copying the answers of others and from giving answers to anyone else taking the course.

SUBMITTING YOUR ASSIGNMENTS

To have your assignments graded, you must be enrolled in the course with the Nonresident Training Course Administration Branch at the Naval Education and Training Professional Development and Technology Center (NETPDTC). Following enrollment, there are two ways of having your assignments graded: (1) use the Internet to submit your assignments as you complete them, or (2) send all the assignments at one time by mail to NETPDTC.

Grading on the Internet: Advantages to Internet grading are:

- you may submit your answers as soon as you complete an assignment, and
- you get your results faster; usually by the next working day (approximately 24 hours).

In addition to receiving grade results for each assignment, you will receive course completion confirmation once you have completed all the assignments. To submit your assignment answers via the Internet, go to:

http://courses.cnet.navy.mil

Grading by Mail: When you submit answer sheets by mail, send all of your assignments at one time. Do NOT submit individual answer sheets for grading. Mail all of your assignments in an envelope, which you either provide yourself or obtain from your nearest Educational Services Officer (ESO). Submit answer sheets to:

COMMANDING OFFICER
NETPDTC N331
6490 SAUFLEY FIELD ROAD
PENSACOLA FL 32559-5000

Answer Sheets: All courses include one "scannable" answer sheet for each assignment. These answer sheets are preprinted with your SSN, name, assignment number, and course number. Explanations for completing the answer sheets are on the answer sheet.

Do not use answer sheet reproductions: Use only the original answer sheets that we provide—reproductions will not work with our scanning equipment and cannot be processed.

Follow the instructions for marking your answers on the answer sheet. Be sure that blocks 1, 2, and 3 are filled in correctly. This information is necessary for your course to be properly processed and for you to receive credit for your work.

COMPLETION TIME

Courses must be completed within 12 months from the date of enrollment. This includes time required to resubmit failed assignments.

PASS/FAIL ASSIGNMENT PROCEDURES

If your overall course score is 3.2 or higher, you will pass the course and will not be required to resubmit assignments. Once your assignments have been graded you will receive course completion confirmation.

If you receive less than a 3.2 on any assignment and your overall course score is below 3.2, you will be given the opportunity to resubmit failed assignments. **You may resubmit failed assignments only once.** Internet students will receive notification when they have failed an assignment--they may then resubmit failed assignments on the web site. Internet students may view and print results for failed assignments from the web site. Students who submit by mail will receive a failing result letter and a new answer sheet for resubmission of each failed assignment.

COMPLETION CONFIRMATION

After successfully completing this course, you will receive a letter of completion.

ERRATA

Errata are used to correct minor errors or delete obsolete information in a course. Errata may also be used to provide instructions to the student. If a course has an errata, it will be included as the first page(s) after the front cover. Errata for all courses can be accessed and viewed/downloaded at:

http://www.advancement.cnet.navy.mil

STUDENT FEEDBACK QUESTIONS

We value your suggestions, questions, and criticisms on our courses. If you would like to communicate with us regarding this course, we encourage you, if possible, to use e-mail. If you write or fax, please use a copy of the Student Comment form that follows this page.

For subject matter questions:

E-mail: n313.products@cnet.navy.mil
Phone: Comm: (850) 452-1001, Ext. 2169
DSN: 922-1001, Ext. 2169
FAX: (850) 452-1370
(Do not fax answer sheets.)
Address: COMMANDING OFFICER
NETPDTC (CODE N313)
6490 SAUFLEY FIELD ROAD
PENSACOLA FL 32509-5237

For enrollment, shipping, grading, or completion letter questions

E-mail: fleetservices@cnet.navy.mil
Phone: Toll Free: 877-264-8583
Comm: (850) 452-151/1181/1859
DSN: 922-1511/1181/1859
FAX: (850) 452-1370
(Do not fax answer sheets.)
Address: COMMANDING OFFICER
NETPDTC (CODE N331)
6490 SAUFLEY FIELD ROAD
PENSACOLA FL 32559-5000

NAVAL RESERVE RETIREMENT CREDIT

If you are a member of the Naval Reserve, you will receive retirement points if you are authorized to receive them under current directives governing retirement of Naval Reserve personnel. For Naval Reserve retirement, this course is evaluated at 9 points. (Refer to *Administrative Procedures for Naval Reservists on Inactive Duty*, BUPERSINST 1001.39, for more information about retirement points.)

COURSE OBJECTIVES

In completing this nonresident training course, you will demonstrate a knowledge of the subject matter by correctly answering questions on the following subjects: dental radiology and examinations; preventive and operative dentistry; oral surgery, periodontic, endodontic, and prosthodontic assistance; dental treatment room emergencies, and forensic dentistry.

Student Comments

Course Title: *Dental Technician, Volume 2*

NAVEDTRA: 14275 **Date:** _____

We need some information about you:

Rate/Rank and Name: _____ SSN: _____ Command/Unit _____

Street Address: _____ City: _____ State/FPO: _____ Zip _____

Your comments, suggestions, etc.:

Privacy Act Statement: Under authority of Title 5, USC 301, information regarding your military status is requested in processing your comments and in preparing a reply. This information will not be divulged without written authorization to anyone other than those within DOD for official use in determining performance.

NETPDTC 1550/41 (Rev 4-00)

CHAPTER 1

DENTAL RADIOLOGY

INTRODUCTION

The purpose of dental radiography is to record images of a patient's oral structures on film by using X-rays. When the X-ray films are processed, the resulting radiographs provide the dental officer with a valuable diagnostic aid. In the case of death, radiographs can be used to aid in identification as discussed in chapter 10, "Forensic Dentistry."

The first section of this chapter covers the basic fundamentals of dental radiography. Included are the physics and biology of radiography.

Since X-radiation can be harmful, you must observe certain safety precautions when using an X-ray machine or working in an area where one is being used. These precautions are covered in the second part of this chapter.

The major portion of this chapter is devoted to explaining how to operate a dental X-ray machine, expose intraoral radiographs (radiographs taken inside the patient’s mouth), process the X-ray films, and mount the finished radiographs.

The last part of this chapter covers the panoramic X-ray machine, which you will use to make extraoral radiographs (radiographs made outside the patient’s mouth).

FUNDAMENTALS OF DENTAL RADIOLOGY

Oral radiography is the art of recording images of a patient’s oral structures on film by using X-rays (roentgen rays). The rays were recognition of Wilhelm Konrad Roentgen, a scientist, who first discovered X-rays in 1895. While experimenting with a device called a Crookes tube, which generated cathode rays, he noted that a photographic plate completely wrapped in black paper and lying near the tube was fogged when developed. He realized that some form of invisible ray, able to pass through the black paper, must be coming from the tube. Later, while in his darkened laboratory, he noticed that a fluorescent screen located six feet away was glowing. He knew that the cathode rays could travel only short distances outside the cathode tube and realized he was observing a new, unknown ray, which he called an X-ray because the symbol "X" is used for the unknown in mathematics.

The first dental radiograph was taken the same year by Dr. Otto Walkoff. Within 10 years, radiographs were being used for diagnosis of medical and dental conditions, for X-ray therapy, and- for scientific studies. Although technology over the years has made tremendous improvements in X-ray equipment, the basic concepts are the same.

Like visible light rays, X-rays are electromagnetic rays that travel in a wave motion. The measurement of this wave motion is called a wavelength. The basic difference between X-rays and other electromagnetic rays is in their wavelength. X-rays have an extremely short wavelength, which enables them to penetrate matter that usually absorbs or reflects light or other electromagnetic rays with longer wave-lengths.

Although X-rays share the properties of other electromagnetic rays, their action is considerably different. Some of the characteristics and properties of X-rays are:

- They travel in straight lines at the speed of light.
- They affect photographic film by producing a hidden image made visible by processing.
- They cause certain substances to fluoresce (glow).
- They cause irritation of living cells and, in large amounts, can cause necrosis (death) of the cells, a fact that necessitates caution in using X-rays.

X-rays are produced when a metal (tungsten) target is bombarded by a stream of electrons. The X-rays are emitted in the tubehead and directed by the tubehead cone through the subject, producing an image on the film.

The density of the X-ray image is controlled by four factors: kilovoltage (kVp), exposure time, milliamperage (mA), and target-film distance (TFD). All of these factors are interrelated and may be varied by the operator. The procedures for setting these factors will be discussed later.

RADIATION SAFETY

Proper safety precautions must be observed by all persons working in or near an area where X-rays are being generated. X-rays can be dangerous. Long term overexposure to radiation may result in loss of hair, redness and inflammation of the skin, blood count change, cell atrophy (wasting away), ulcerations, sterility, genetic damage, cancer, leukemia, and death.

There are safety measures designed to protect the patient and the health care team from the dangers of overexposure to radiation and the operation of X-ray equipment. You must observe these safety measures when working in radiology. Your command will have instructions and standard operating procedures (SOP) for the operation of dental radiographic (X-ray) units and equipment. You will be required to read these procedures if you are newly assigned to the radiology department. There are other numerous responsibilities that include providing radiology support for oral diagnosis, log maintenance, infection control, testing for quality control, and processor maintenance.

PATIENT PROTECTION

A number of precautions are taken to prevent the patient from being exposed to inappropriate diagnostic radiation. The decision to order dental radiographs is determined by the dental officer on a case by case basis for each patient. **Only** a dental officer is authorized to order and diagnostically interpret dental radiographs.

Perhaps the most important safety measure is the responsibility of the assistant: **When taking radiographs, you should always have patients wear lead aprons and thyroid collars to shield their reproductive organs and thyroid glands. There is only one exception to this rule; when obtaining a panorex radiograph, the thyroid collar is not used since it blocks part of the X-ray beam.** In addition, always ask a female patient whether or not she is pregnant or if pregnancy is questionable, before taking radiographs. If she is pregnant, consult the dental officer.

Other radiation safety measures include X-ray machines that have built-in safeguards that filter out harmful radiation and restrict the central X-ray to the smallest possible area. Fast film is used to shorten expos ure time; and only essential radiographs are taken on patients.

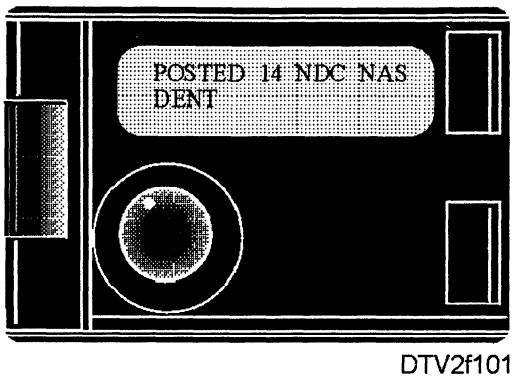

Figure 1-1.—Environmental dosimetry radiation film badge.

ASSISTANT PROTECTION

When you work near a source of radiation, your X-ray department will be issued an environmental dosimetry radiation film badge (fig. 1-1).

Appropriately placed environmental film badges are used to monitor stray radiation that may occur in and around the X-ray department. The badges are placed in the X-ray room behind the technicians protective lead-lined barrier or at least 6 feet from the tube head and never in the direct line of radiation during expos ure. These film badges contain X-ray sensitive film in a light-tight packet. The film packets are collected every 6 to 7 weeks. After collection, the film is sent to the radiation detection laboratory for processing and evaluation. Any abnormally high readings (i.e., greater than 0.010 REM [Radiological Equivalent Mammel]) shall be referred to the Radiation Health Office for investigation.

When you take radiographs on a patient, observe the following precautions to avoid unnecessary exposure to radiation:

- NEVER stand in the path of the central X-ray beam during exposure.
- NEVER hold the X-ray film packet in the patient's mouth during exposure.
- NEVER hold the tube head or the tube head cylinder of the X-ray machine during exposure.
- ALWAYS stand behind a lead-lined screen during an exposure.

X-RAY FILM LOG

Another portion of radiation safety is to account for all radiographs that are taken. An X-ray film log

shall be maintained in all X-ray rooms and will contain the following information:

Column 1: Patient's Name

Column 2: Patient's SSN

Column 3: Patient's Unit

Column 4: Rank/Rate/Retired/Dependent/etc.

Column 5: Number of X-ray exposures and type: bitewing, periapical, occlusal, panograph

Column 6: kVp, mA, exposure time

Column 7: Reason retake X-ray required (if applicable)

When stating the reason for a retake X-ray, be specific on the nature of the retake, for example: conecut, elongated, foreshortened, dark image, etc.

DENTAL X-RAY MACHINES

The most commonly used X-ray machine is the wall-mounted dental X-ray unit (fig. 1-2). Because the basic components and operating techniques of all dental X-ray machines are similar, we will only discuss the wall-mounted unit. The component parts of the wall-mounted machine discussed here are the tube head, cylinder, extension arm, ready light, and a separate control panel.

TUBE HEAD

The tube head (fig. 1-3) contains the X-ray tube and other components necessary for generating X-rays. When an exposure is made, X-rays pass through an aluminum filter that screens out unnecessary radiation. Angulation scales are on both sides of the tube head for precise positioning technique.

CYLINDER

The cylinder (or cone) is affixed to the tube head and is used to align the tube head with the patient and the X-ray film. It is open-ended and composed of lead laminated material that establishes the minimum distance from the X-ray source to the patient’s skin.

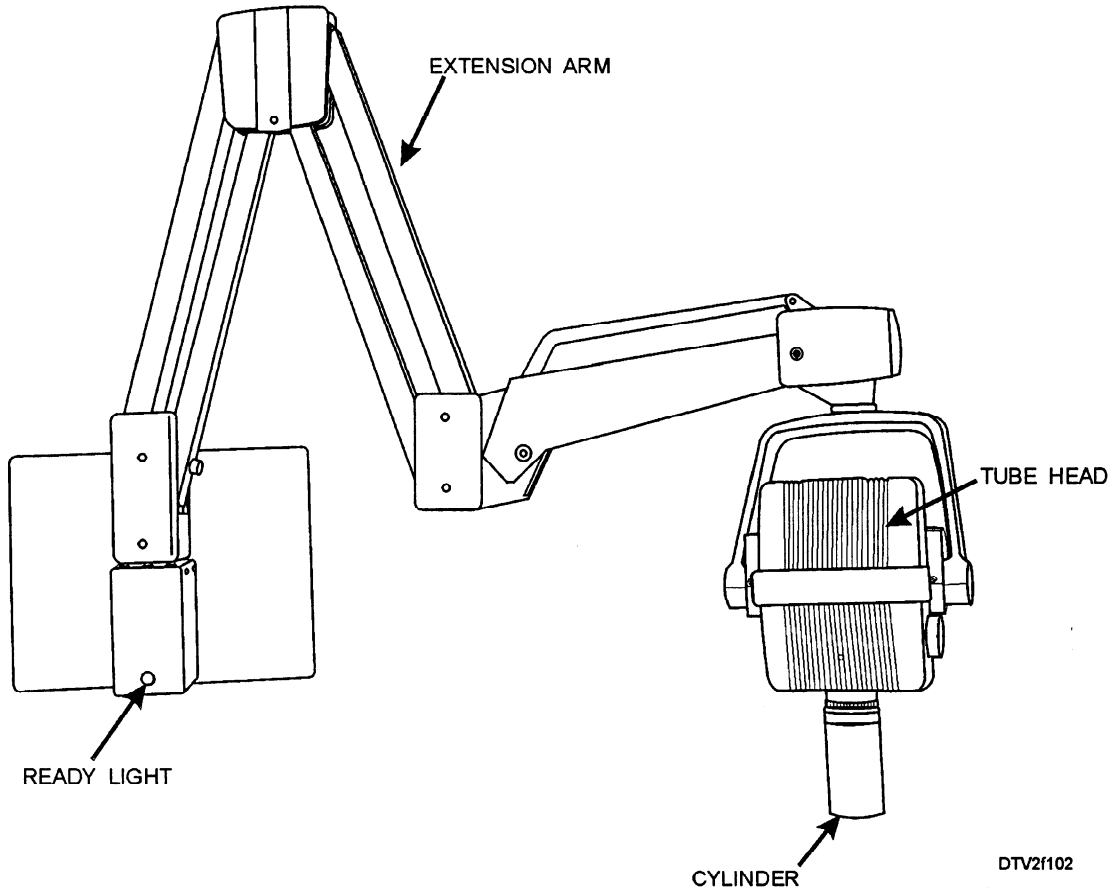

Figure 1-2.—Wall-mounted X-ray machine.