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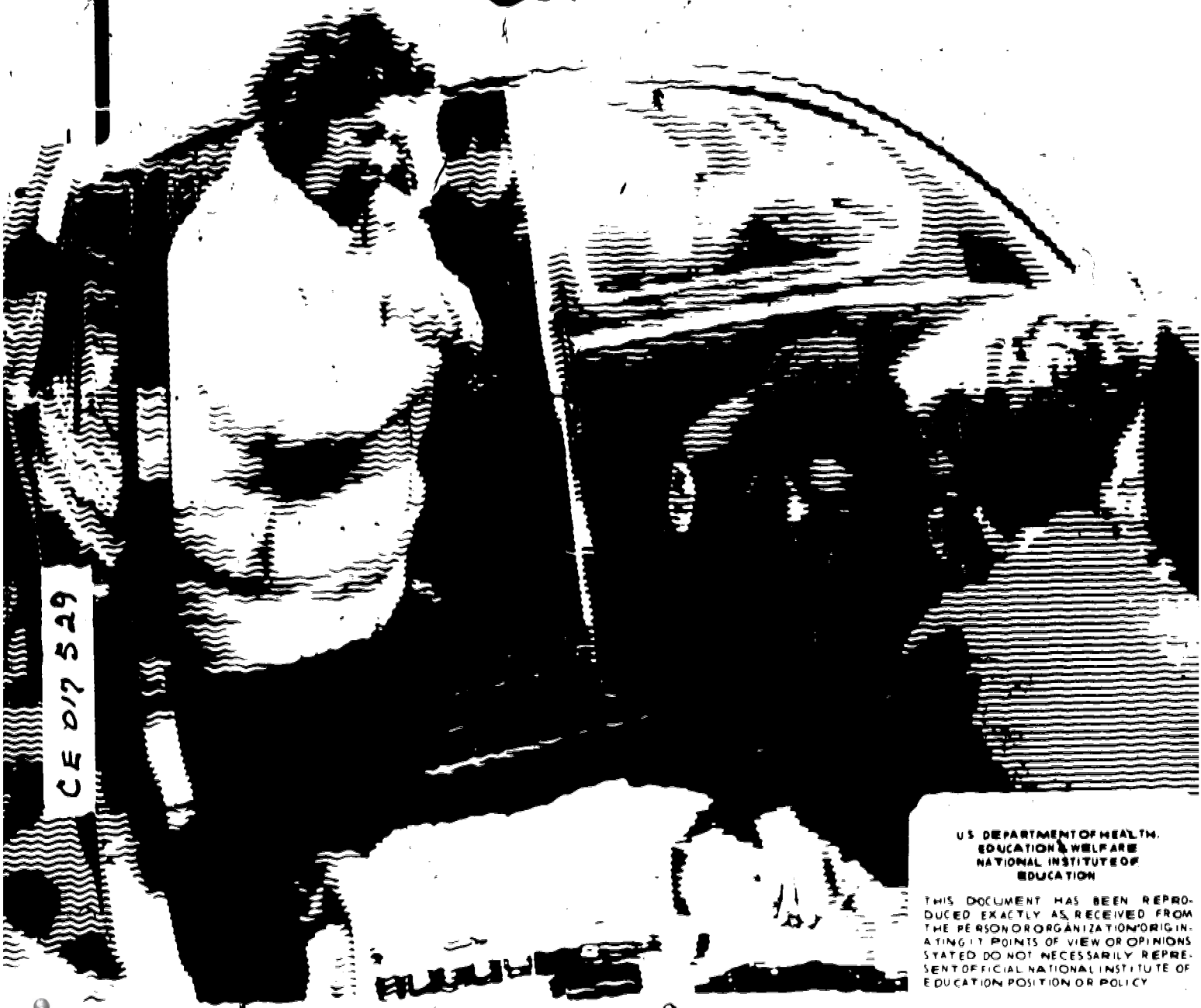
ABSTRACT

This instructor's lesson plan guide on telemetry and communications is one of fifteen modules designed for use in the training of emergency medical technicians (paramedics). Two units of study are presented: (1) emergency medical services communications systems (items of equipment and such radio communications concepts as frequency allocation, very high frequency [VHF] communications, ultrahigh frequency [UHF] communications, frequency-modulated [FM] radios, and amplitude-modulated [AM] radios, voice communications, and biotelemetry communications); and (2) communication regulations and procedures (requirements for standard operating procedures including coded communication, locally developed protocols, and dispatch). Each unit contains these elements: behavioral objectives, teaching procedures, a content outline, demonstration outlines, and lists of needed equipment and materials. Student skill evaluation sheets are provided. (It is suggested that each module can be presented individually or combined with other modules to construct a course for a selected group of students. CE 017 514 is a course guide for use in planning and implementing the total training program.) (JH)

National Training Course
EMERGENCY MEDICAL TECHNICIAN
PARAMEDIC
INSTRUCTOR'S LESSON PLANS

Module – **XV**

Telemetry and Communications



U.S. Department of Transportation / National Highway Traffic Safety Administration

National Training Course

EMERGENCY MEDICAL TECHNICIAN PARAMEDIC

INSTRUCTOR'S LESSON PLANS

Module XV

Telemetry and Communications

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HOW TO USE THE INSTRUCTOR LESSON PLANS

NOTES

The *Instructor Lesson Plans* are guides for teaching an advanced-level training program for emergency medical technicians. The *Plans* cannot be used by the instructor to develop the competency to conduct the program; the instructor should have this as a prerequisite to teaching the course.

The *Instructor Lesson Plans* are comprised of 15 modules, each containing the information and instructions needed to conduct a program on a particular subject. Each module can be used by itself or in concert with other modules.

Each module is subdivided into instructional units that deal with a particular segment of the module subject. Generally, the units contain the following components:

- *Performance Objectives.* These are classified as knowledge (K) objectives or skill (S) objectives. They are written in behavioral terms so they can be evaluated either through observation of student activities or through results obtained under specified conditions.
- *Unit Activities.* Reading assignments, reference materials, and outside activities are presented for both the students and the instructor. If the activities are identical, only the instructor's activities are presented.
- *Equipment and Materials.* Educational equipment includes chalkboard, overhead projector, slide projector, and screen. Medical equipment and materials required are drawn from those listed in Appendix F of the *Course Guide*.

- *Content Outline.* This presents the topics to be covered during the presentation of the unit. Where appropriate, it is divided into single skills or concepts. This approach gives the instructor the flexibility to add or delete specific skills and information. The content outline also provides directions to the instructor indicating when the use of demonstrations or group discussions would be most appropriate.

  Because the units are designed to be taught by technically competent instructors, the content outlines are not specific; they only enumerate topics and subtopics. It is expected that the instructor's skill and knowledge will supplement the depth of the course content outline. The instructor is encouraged to prepare additional notes.

- *Demonstration Outlines.* These are designed to present procedural steps that are important in performing the particular skill or calculation. Steps that are critical or that may lead to common errors are emphasized. Where critical steps exist, these outlines suggest what should be demonstrated.
- *Practice Sessions.* These sessions serve as guides to activities to be performed by students applying the skills. They may be performed in the classroom or assigned as homework. During classroom practice sessions, the instructor will be available to observe and correct student performance and to answer any questions.
- *Skill Evaluations.* The skill evaluation sheets provide checkpoints for the instructor to use to insure that students are following appropriate procedures or sequences. Skill evaluation sheets also provide a convenient method for feedback to students having particular problems with a given skill, and for monitoring a student's progress in attaining skill objectives.

The skill evaluation should occur only after the students have had an opportunity to practice the skill under the supervision of the instructor. The skill evaluation sheets can be distributed during, or before, the demonstration or practice session. Thus, they can be used as a job aid during practice. They should not be used, however, as a job aid while the student is being evaluated. The sheets are designed to provide a learning and evaluation tool

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and are not intended to mandate performance in the field in a set manner, irrespective of the patient's condition or situation.

Satisfactory performance of a given skill is defined as the correct performance of all steps in the proper sequence. The instructor's judgment is required to define correct performance and sequence of steps in a skill. Skill evaluations may be repeated at intervals throughout the course to assess skill decay and the need for remedial practice. Some instructors may wish to test skills immediately after they have been learned and again at the conclusion of the course.

The alphanumeric coding system is used to identify the various modules and units. When you see, for example, in Module II, 3.6.1.K, the 3 indicates the unit, the 6 indicates the main instructional topic, the 1 indicates the subsection of the major topic outlined in 3.6, and the K indicates the teaching objective (in this case, knowledge).

To illustrate further, 3.6.1.K would translate into:

- 3 = Unit number
- 6 = The main topic of the instructional section (The first two numbers—e.g., 3.6—refer to a major heading in the unit content outline.)
- 1 = A subsection of the major topic outlined in 3.6 (This number relates to the number of objectives listed under skill or knowledge objectives and not to the content outline.)
- K = Knowledge objective
- S = Skill objective

The three-digit reference numbers (e.g., 3.6.1) within each module refer to the topical section in that module only. For example, in Module II, any topical heading with 3.6 as the first two digits refers to the discussion of the components of patient assessment in Unit 3.

A visual presentation of Unit 3, by Module II, of the coding system is presented on the following pages.

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SAMPLE PAGE

CODING SYSTEM EXAMPLES

NOTES

- Abdomen
- Extremities

3.6.1.K Given a situation describing a patient with a possible illness or injury who may or may not be able to communicate, the student should be able to describe the procedure for evaluating the patient described. Minimally, the student should include the appropriate primary assessment and specify the order of the four components of the secondary assessment and the areas of the assessment that would be emphasized:

the demonstration, auscultation of the lung, heart, and abdominal sounds.

3.6.1.S Given a student posing as a communicative patient, the student should be able to demonstrate the procedure for conducting a patient assessment when the patient is suspected of having the following:

SAMPLE PAGE

CODING SYSTEM EXAMPLES

NOTES

8. Practice Session 3

3.6. Four components of assessment (order)

A. If the patient can communicate, determine if he has a medical or trauma-related problem.

1. If a medical problem, the general order should be:
   a. Evaluate the diagnostic and vital signs.
   b. Develop the patient's history.
   c. Examine for a medical problem.

Skill Evaluation 3.6.1.S: Assessment of a Communicative Patient With a Suspected Trauma-Related Problem

Place an "X" in the appropriate column to indicate steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform the skill.

Equipment

Student posing as a victim
Stethoscope

Clinical Training

To present this program, it will be necessary to have access to the clinical units listed below. If a unit is not available, adjustments should be made to insure that the activities proposed for that unit are included in others. Specific guidelines for the clinical units are included in the modules. The student's training should be supervised in each of the following clinical areas:

- Emergency department
- Intensive care unit/coronary care unit
- Operating/recovery room
- Intravenous (IV) team
- Pediatric unit
- Labor suite/delivery room/newborn nursery
- Psychiatric unit
- Morgue
- Mobile intensive care unit

Sample forms for maintaining student activity records are included in the *Instructor Lesson Plans*. The forms are designed so that the medical director can determine the number of times, and how successfully, a student has performed a skill. The medical director also will be able to determine how much time the student needed to become proficient in the skill. Further, the medical director will be able to evaluate student performance under a number of preceptors, because certain skills are repeated in various clinical units (e.g., initiating an IV is performed by the student with the IV team and in the emergency department and intensive care unit).

Although the clinical experience is listed with the module, it need not be presented each time, even if a number of modules are being presented.

Testing and Evaluating the Student

It is recommended that each student be evaluated on proficiency of skill and knowledge at the completion of each module. Skill evaluation sheets have been provided for each skill in each unit. These sheets can be used as guides for evaluating the student's skill proficiency. The evaluation of the knowledge objectives is left to the discretion of the instructor, according to predetermined objectives.

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Testing of knowledge should stress areas of clinical relevance over basic science. No matter what type of evaluation system is used, students should be kept informed of their progress and should be given additional activities to supplement weak areas.

As previously stated, the emphasis is on student competency, rather than on the total number of hours the student is involved in the program. Thus, it is possible for the student to be tested and given credit for any module. The medical director should not assume the student's competency simply because of prior training, but should develop an evaluation method to determine the student's proficiency based on first-hand observation and experience. With this type of method, it is possible for students to receive credit for prior training experience. This would be especially applicable for those modules that are primarily a review of skills concerned with Emergency Medical Technician-Ambulance; for example, soft-tissue injuries and rescue.

NOTES

MODULE XV TELEMETRY AND COMMUNICATIONS

INTRODUCTION

Prerequisites

The student must have successfully completed the following modules:

I. The Emergency Medical Technician, His Role, Responsibilities, and Training

II. Human Systems and Patient Assessment

Description of Module

Through lecture, demonstrations and practice sessions, this module provides training in emergency medical services (EMS) communication techniques and procedures. The type of equipment involved is discussed, and a description of how that equipment is employed in a systemwide communication network is provided. The regulating agency controlling all radio communications, the Federal Communications Commission (FCC), is described, and guidelines for the development of standard operating procedures and protocols are discussed. The following presents descriptions of the two units in this module:

Unit 1. EMS Communications System: The various phases of an EMS communications system are presented and the function of each phase is explained. Each item of communication equipment that might be involved in an EMS system is described as to its

operation and function within the system. Basic concepts of radio-communications are presented including discussions of frequency allocation, very high frequency (vhf) communications, ultrahigh frequency (uhf) communications, frequency-modulated (FM) radios, amplitude-modulated (AM) radios, voice communications, and bio-telemetry communications.

Unit 2. Communications Regulations and Procedures: The FCC is described as the regulating body of all communications, and a brief description of its activities is provided. Requirements for standard operating procedures are discussed, including the need for coded communication. Demonstrations and practice sessions are included for the types of radios that the students will be using in the field. Also discussed is the need for locally developed protocols used in relaying patient assessment information and telemetry to a physician. The importance of the dispatch phase of EMS communications is emphasized, and a description of the role and responsibilities of the dispatcher is provided.

There is no clinical experience unit in this module.

NOTES

UNIT 1

emt-p

EMS COMMUNICATIONS SYSTEMS

NOTES

Knowledge Objectives

After completing this module, the student should be able to correctly respond to at least 80 percent* of the following:

1.1.1.K The student should be able to list seven steps of an EMS communications system.

1.1.2.K Given a list of definitions, the student should be able to select the definition that best describes an emergency-operations center (EOC).

1.1.3.K Given a list of organizations, the student should be able to select four organizations that should be included in the total EMS communications system.

1.1.4.K Given that other radio facilities may be involved in contingency planning, the student should be able to list at least three such facilities.

1.2.1.K The student should be able to list at least six possible components of an EMS communications system.

1.2.2.K Given that location affects the operation of a base station, the student should be able to list those factors that

*The selection of 80 percent as a passing criterion is arbitrary and can be modified.

determine the best location for a base station, including such factors as:

- The highest location available
- The most central location available
- The location closest to the operational base of the system

1.2.3.K Given that a portable transmitter/receiver is to be used, the student should be able to describe the position of the antenna that delivers maximum range.

1.2.4.K Given that a mobile repeater system is used, the student should be able to describe how the portable transmitter/receiver may be used with a range equal to a mobile transmitter/receiver.

1.2.5.K Given a list of methods, the student should be able to select the method by which a remote console is connected to the base station.

1.2.6.K Given that an encoder and decoder system is in existence, the student should be able to describe the use and operation of the encoder and decoder.

1.3.1.K Given that there are two frequency ranges used in an EMS communications system, vhf and uhf, the student should be able to describe in writing their differences in:

- Range
- Building penetration
- Interference
- Designated use

1.3.2.K Given that biotelemetry uses a reference signal and given a list of statements, the student should be able to select the statement that best describes the purpose of a reference signal.

1.3.3.K Given that interference (noise) may occur in biotelemetry communications, the student should be able to list at least four causes of interference.

NOTES

1.3.4.K Given at least three statements describing radio systems, the student should be able to label each statement as:

- Simplex
- Duplex
- Multiplex

NOTES

Instructor Activities

Assign the material referred to below during the class period immediately before beginning the unit.

- Chapter 14 in the *Text*
- Knowledge objectives for the unit
- The Public Safety Communication Standard Operating Procedures (SOP) Manual Pages 13–80.

Prepare a lecture following the content outline on page XV-6. The following suggestions are made:

- Introduction: Write unit topics on the chalkboard and allow them to remain during the unit.
- 1.1: Ask students to list phases.
- 1.2: If visual aids are not available, contact manufacturers' representatives to get handouts, etc.
- 1.2D: Ask students to explain function and operation of repeaters.
- 1.3A: Write abbreviations on the chalkboard.
- 1.3E: Write all systems on the chalkboard.

Prepare a written test using the knowledge objectives.

Equipment and Materials

Equipment—Educational

Chalkboard and chalk

Equipment—Medical

None

Materials

Knowledge objectives (optional)
Written examination
Answer sheets and pencils
Text
Standard Operating Procedures (SOP) Manual

NOTES

Content Outline

Introduction

- Point out that during this unit, the following topics will be discussed:
  - System phases
  - System components
  - Radio communications: voice and telemetry
- Write topics on the chalkboard.

I.1. System phases (ask students for phases)

A. Notification
   1. Define it as the method by which the dispatch control center is notified.
      a. Point out that notification may be through the 911 emergency telephone system.
      b. Point out that the dispatch center may be an EOC handling all local emergency service.
   2. Point out that public education can improve this phase of the system.
      a. Recognition of the conditions requiring emergency care
      b. Knowledge of the methods of notification available

B. Dispatch
   1. Define it as the method of selecting the appropriate response personnel and directing them to the scene.
   2. Point out that this procedure may be accomplished by telephone or radio.

C. Communication between the dispatcher and the vehicle(s)
   1. Discuss communication en route to the scene.

2. Discuss communication at the scene.
3. Discuss communication en route to the patient's destination.
4. Point out that constant communication is necessary:
   a. To provide additional dispatch information
   b. To request support services
   c. To request additional vehicles and personnel

D. Communication between paramedics and the physician
   1. Communication is needed to receive orders for advance medical procedures.
   2. Flexibility is required.
      a. Mobile to base
      b. Mobile to base to phone patch to remote receiver

E. Communication between area hospitals
   1. Communication is needed especially in multiple casualty distribution.
   2. Communication can be through phone lines, radios, or both.

F. Communication links with support agencies (e.g., fire, police, civil defense, crisis-intervention team)
   1. These links are partially accomplished in the EOC concept.
   2. Telephone lines are generally useful.
   3. There should be a backup radio network for use when phone communication is disrupted or overloaded.

G. Coordination of other radio networks to be used in contingency planning
   1. Amateur Radio Public Service Corps (ARPSC)
   2. Radio Amateur Civil Emergency Service (RACES)
   3. Business radio systems
      a. Taxi services
      b. Trucking companies
   4. Citizens' band radio clubs or individuals
   5. Commercial broadcast services
      a. Local radio stations
      b. Local television stations

1.2. System components

A. Base station
   1. Point out that the terrain location greatly affects the function.

NOTES

a. Highest elevation available should be used.
b. Antenna should be as close as possible to the base station transmitter/receiver.
c. Base station should be located as close to the center of the communications system as possible.

2. Discuss the power output (usually 80–150 watts) controlled by the FCC.
3. Point out that a good high-gain antenna improves transmission and reception efficiency.
4. Point out that multiple-frequency capability is available at the base station.

B. Mobile transmitter/receivers

1. Point out that transmitter/receivers are vehicle mounted.
2. Point out that there are a variety of power ranges available.
3. Point out that transmitters are in the 7.5-watt range.
   a. Transmission range is 10–12 miles over rolling terrain.
   b. Transmission range is improved over flat land or water while it is decreased in more mountainous terrain.
   c. Higher output wattages increase range.
4. Point out that a properly mounted high-gain antenna increases efficiency.
5. Explain all operational controls of the unit(s) to be used by the students.

C. Portable transmitter/receivers

1. Point out that they are handheld for use away from a mobile radio.
2. Point out that the usual power output is 5 watts, which limits the range.
   a. Vertical position of antenna maximizes the range.
   b. Range is highly variable based on the location.
3. Point out that the range can be equal to that of a mobile unit when retransmitted through a vehicle radio.
4. Point out that multiple-frequency capability is available.
5. Explain all operational controls of the unit(s) to be used by the students.

NOTES

D. Repeaters (ask the students for the function)
   1. Repeaters are used to extend the transmission range.
   2. They receive a signal on one frequency and retransmit that signal on another frequency.
   3. Repeaters may be fixed or mobile (in the vehicle).
   4. Repeaters are often used in combination.
   5. Repeaters are useful in hilly or mountainous terrain.

E. Remote consoles
   1. Define them as a control console connected to the base station by telephone lines.
   2. Point out that they are required for the use of the base station from another location.
   3. Point out that they contain an amplifier, speaker, and microphone for reception and transmission control.

F. Encoders and decoders
   1. Point out that the digital encoder (resembles a telephone dial) is dialed, causing pulsed tones to be sent over the air.
   2. Point out that pulses are received by all receivers on that frequency, within the range.
   3. Point out that each receiver has a locally unique code address (3- or 4-digit number).
   4. Point out that the reception of the correct pulsed tones opens the audio circuits of the receiver (decoder does this).
      a. Other users may listen.
      b. Only properly coded messages can be received by the decoder-equipped receiver.
   5. Explain all operational controls of the unit(s) to be used by the students.

1.3. Radio communications: voice and telemetry

A. Radio frequencies are designated by cycles per second or Hertz.
   1. Write commonly used abbreviations on chalkboard.
      a. Hertz (Hz)—cycles per second
      b. Kilohertz (kHz)—1,000 cycles per second
      c. Megahertz (MHz)—1,000,000 cycles per second
      d. Gigahertz (GHz)—1,000,000,000 cycles per second

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2. Point out that radio waves are confined between 3 kHz and 3,000 GHz.
3. Point out that frequency bands are portions of the spectrum assigned for specific uses.
   a. Discuss medical communications—uhf and vhf bands.
   b. Discuss vhf—30–50 MHz.
      (1) Low band—30–50 MHz
      (2) High band—150–175 MHz
   c. Discuss uhf—300–3,000 MHz.
      (1) Most medical communications are around the 450- to 470—MHz range.
      (2) There is better penetration in dense metropolitan areas.
      (3) The range is shorter than in vhf.
   d. Point out that the higher the frequency, the less interference, noise (signal distortion), and range.

B. The vhf and uhf band communication use FM equipment.
   1. This equipment is opposed to AM equipment (e.g., citizens' band radios are AM).
   2. FM more easily eliminates noise and interference than AM.

C. The FCC controls frequency allocations.
   1. Currently, vhf is for general emergency radio communications.
   2. The uhf band is for ambulance-to-hospital telemetry systems.
      a. Electrocardiogram (EKG)
      b. Voice communication concerning instructions for patient care

D. Biotelemetry of EKG's
   1. Standard EKG signals are very low (100 Hz and less).
   2. FM voice communication systems would filter out such frequencies.
   3. A reference tone is used.
      a. The tone is constant and predetermined.
      b. EKG impulses modify this constant reference tone.
      c. When decoded at the receiver, the original EKG voltage is sent into an oscilloscope.
   4. Interference may be from:
      a. Loose electrodes (EKG)

NOTES

b. Muscle tremor
c. 60-cycle alternating-current sources
d. Attenuation of transmitter power

E. Employment of frequencies in a system
1. Simplex—one frequency
2. Duplex—two frequencies used at the same time
3. Multiplex—the combination of two signals for transmission simultaneously on one frequency

F. Summary
1. System phases
2. System components
3. Radio communications: voice and telemetry

NOTES

UNIT 2 emt-p

COMMUNICATIONS REGULATIONS AND PROCEDURES SYSTEM

NOTES

Knowledge Objectives

After completing this module, the student should be able to correctly respond to at least 80 percent* of the following:

2.1.1.K Given a list of statements describing functions, the student should be able to select those statements that best describe the functions of the FCC.

2.1.2.K Given a list of activities, the student should be able to select those activities that are performed by the FCC. That list should include such items as:

- Monitor frequencies
- Road checks
- Spot checks of base stations

2.2.1.K Given that standard communication procedures are important in an EMS system, the student should be able to list at least three reasons why standard procedures are important.

2.2.2.K Given a list of personnel, the student should be able to select those personnel who should be trained in the communication system's standard operating procedure.

*The selection of 80 percent as a passing criterion is arbitrary and can be modified.

2.2.3.K Given that coded messages are part of the communication standard operating procedure, the student should be able to list at least three reasons for the inclusion of a code (10 code or case code) within the communication standard operating procedure.

2.2.4.K Given a list of statements, the student should be able to select those statements that best describe the reasons for the development and use of protocols for biotelemetry.

2.3.1.K Given a list of information items, the student should be able to select the information that must be gathered by the dispatcher.

2.3.2.K Given a list of statements describing decisions, the student should be able to select those statements that best describe the decisions to be made by a dispatcher.

2.3.3.K Given a list of times to be recorded, the student should be able to select those times that should be recorded by the dispatcher.

2.4.1.K Given a list of information items, the student should be able to select those items that should be included in a standard reporting format in reporting patient assessment information to a physician by radio.

2.4.2.K Given a list of reasons, the student should be able to select those reasons for the use of a standard format for presentation of information to the physician.

2.4.3.K Given a list of disadvantages, the student should be able to select the disadvantages if a standardized format is not developed and used in relaying information to the physician.

Skill Objectives

After completing this module, the students should be able to correctly perform each of the skill objectives. "Correctly" will be

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defined by the instructor during the lecture and demonstration sessions. Skill-evaluation sheets are included in the module.

NOTES

2.2.1.S Given a mobile transmitter/receiver, the student should be able to operate that unit to receive and transmit using the correct radio procedure as described by the instructor.

2.2.2.S Given a portable transmitter/receiver, the student should be able to operate that unit to receive and transmit using the correct radio procedure as described by the instructor.

2.2.3.S Given a mobile transmitter/receiver equipped with a digital encoder, the student should be able to operate the encoder correctly as described by the instructor.

2.4.1.S Given a simulated mobile transmitter/receiver, a simulated patient, and a simulated telemetry transmitter, the student should be able to:

- Organize and transmit patient assessment information using a standardized format
- Transmit an EKG using the telemetry transmitter

Instructor Activities

Assign the knowledge and skill objectives for this unit during the class period immediately before beginning the unit.

Prepare a lecture following the content outline on page XV-16. The following suggestions are made:

- Introduction: Write unit topics on the chalkboard and allow them to remain there during the unit.
- 2.1.B: Before class, obtain the address and phone number of your regional FCC office.
- 2.2.B: Prepare copies of sample codes to be used locally and distribute them to the class.
- 2.2.C: Prepare copies of the telemetry protocols and distribute them.

Arrange a tour of the dispatching center. Each student should be given the opportunity to observe the dispatching process. Note: It may be determined (by local option) that each student should participate and gain experience as a dispatcher. If so, time should be spent in the dispatching center during the clinical experience.

Test the students, using the skill evaluation sheets.

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Equipment and Materials

Equipment—Educational

Chalkboard and chalk

Communications Equipment (one for every four to five students)

Mobile receiver/transmitter with digital encoder
Portable transmitter/receiver
Telemetry transmitter with electrodes and patch cable

Materials

Knowledge objectives (optional)
Skill objectives (optional)
Written examination
Answer sheets and pencils

Content Outline

Introduction

- Point out that during this unit, the following topics will be discussed
  - FCC
  - Protocols and communication procedures
  - Dispatch procedures
  - Relaying information to the physician
- Write topics on the chalkboard.

NOTES

2.1. FCC

A. FCC was established as a regulatory and controlling agency.
   1. Discuss allocation of frequencies and licenses.
   2. Point out that frequency and license regulations originate at FCC.
   3. Point out that enforcement of regulations is the responsibility of FCC.
      a. To monitor frequencies
      b. To make road checks
      c. To make spot checks of base stations and their records, etc.

B. Field offices are located throughout the United States.
   1. Coordinate communication plans with those offices.
   2. Check FCC regulations and determine how they affect your area.

2.2. Protocols and communication procedures

A. Discuss the importance of standardized operating procedures (SOP) in emergency communications.
   1. Brevity is often critical.
      a. Communications channels may be overloaded.
      b. Patient may require rapid corrective action ordered by the physician.
   2. SOP reduces the number of misunderstood messages.
      a. All personnel must "speak the same language"; use standard phraseology.
      b. No coding system is good unless all required personnel understand its use.
      c. All personnel involved should be trained in the use of any codes (e.g., 10 code).
         (1) Paramedics
         (2) Dispatchers
         (3) Physicians
         (4) Emergency department personnel
         (5) Others involved in direct radio communication (e.g., intensive care unit personnel)
   3. SOP provides a structure for essential communication only.

B. Point out that coded communication provides a mechanism for:
   1. Brief messages
   2. Clear messages
   3. Preventing patients, family, or bystanders from understanding messages
   4. Preventing misunderstanding between critical-care personnel.

C. Point out that protocols for biotelemetry must be developed locally and be strictly followed.
   1. Protocols are essential to assure that complete information is transmitted to the physician.
   2. All personnel involved must be trained in the procedures developed and use of the specific equipment involved.

D. Introduce Demonstrations 2.2.1.S, 2.2.2.S, and 2.2.3.S.

2.3. Dispatch procedures

A. The individual dispatchers must function within the guidelines of the FCC.

B. Dispatch personnel must be able to gather information concerning the nature of the call.
   1. Location
   2. Nature of problem
   3. Telephone number of caller; circumstances surrounding situation

C. Dispatcher must make several key decisions.
   1. What is the nature of the problem (including life-threatening or not)?
   2. Is a paramedic unit required?
   3. Are any support services necessary at the scene (e.g., police, firefighters, crisis workers, or heavy rescue crew)?
   4. Which crew(s) and vehicle(s) should respond?

D. Regardless of the type of dispatch system (emergency operations center, fire, police, etc.), dispatchers must be trained to:
   1. Determine the problem
   2. Provide emergency-care instruction over the phone when appropriate

NOTES

E. Records must be maintained and the dispatcher is often the best one to record, as a minimum, the times:
   1. Call received
   2. Vehicle en route
   3. Vehicle arrived at the scene
   4. Vehicle departed the scene
   5. Vehicle arrived at the destination
   6. Vehicle back in service

F. The dispatcher must alertly monitor communication throughout the call.
   1. He must monitor requests for additional assistance (directions or support).
   2. He must know the status of every vehicle and crew.

2.4. Relaying information to the physician

A. Point out that a standard format for presentation of information to the physician should include:
   1. Patient's age and sex
   2. Patient's chief complaint
   3. A brief, pertinent history of the present illness
   4. Pertinent physical findings
      a. State of consciousness
      b. General appearance
      c. Vital signs

B. Point out that a standard format increases efficiency.
   1. All essential information is provided.
   2. Physician can diagnose rapidly and order the procedures indicated.

C. Point out that if a standardized format is not developed and used, efficiency is affected.
   1. Time is wasted
   2. Patient care is delayed
   3. Frustration may result on the part of all involved

D. Introduce Demonstration 2.4.1.S

Summary

- FCC
- Protocols and communication procedures
- Dispatch procedures
- Relaying information to the physician

NOTES

Demonstration 2.2.1.S: Use of a Mobile Transmitter/Receiver

NOTES

Equipment

Mobile transmitter/receiver (or a simulated replica; either should be identical to the type the students will use)

Procedure

Position all equipment in front of the class so it is readily accessible.

Position equipment so all students can see.

As the skill is demonstrated, describe what is being done. Specifically, detailed instructions should be provided, including such things as:

- Patient teaching
- Hand position and movements
- Complications
- Critical errors

NOTE: Due to the vast number of manufacturers and modifications of this equipment, the steps below provide only general guidelines for demonstration. Variations in the procedure outlined here are expected to be required.

Steps

1. Turn the unit on.
2. Adjust the squelch.
3. Listen to be sure airways are free of other communication.
4. Hold the microphone at a proper distance from the mouth to avoid exhaled air noise.
5. Push the push-to-talk button and pause before speaking (explain why).
6. Call another unit, using their call letters first, and yours second.
7. When using the radio:
   a. Use an understandable rate of speech.
   b. Do not talk too loud.
   c. Do not be hesitant.
   d. Articulate clearly.

e. Speak with good voice quality.
f. Avoid dialect or slang.
g. Do not show emotion.
h. Avoid vocalized pauses.
i. Use proper English.
j. Avoid excessive transmission.

8. Upon termination, use your call sign to let others know you have completed transmission.

NOTES

Demonstration 2.2.2.S: Use of a Portable Transmitter/Receiver

NOTES

Equipment

Portable transmitter/receiver (or a simulated replica; either should be identical to the type the students will use)

Procedure

Position all equipment in front of the class so it is readily accessible.

Position equipment so all students can see.

As the skill is demonstrated, describe what is being done. Specifically, detailed instructions should be provided, including such things as:

- Patient teaching
- Hand position and movements
- Complications
- Critical errors

NOTE: Due to the vast number of manufacturers and modifications of this equipment, the steps below provide only general guidelines for demonstration. Variations in the procedure outlined here are expected to be required.

Steps

1. Turn the unit on.
2. Adjust the squelch.
3. Listen to be sure airways are free of other communication.
4. Hold the microphone within the unit at a proper distance from your mouth and maintain a vertical antenna position.
5. Push the push-to-talk button and pause before speaking (explain why).
6. Call another unit, using their call letters first, and yours second.
7. When using the radio:
   a. Use an understandable rate of speech.
   b. Do not talk too loud.
   c. Do not be hesitant.

d. Articulate clearly.
e. Speak with good voice quality.
f. Avoid dialect or slang.
g. Do not show emotion.
h. Avoid vocalized pauses.
i. Use proper English.
j. Avoid excessive transmission.

8. Upon termination, use your call sign to let others know you have completed transmission.

NOTES

Demonstration 2.2.3.S: Use of a Digital Encoder

NOTES

Equipment

A mobile transmitter/receiver equipped with a digital encoder

Procedures

Position all equipment in front of the class so it is readily accessible.

Position equipment so all students can see.

As the skill is demonstrated, describe what is being done. Specifically, detailed instructions should be provided, including such things as:

- Patient teaching
- Hand position and movements
- Complications
- Critical errors

NOTE: Due to the vast number of manufacturers and modifications of this equipment, the steps below provide only general guidelines for demonstration. Variations in the procedure outlined here are expected to be required.

Steps

1. Turn the unit on.
2. Adjust the squelch.
3. Listen to be sure airways are free of other communication.
4. Select the address code to be dialed.
5. Dial the selected numbers.
6. Hold the microphone at a proper distance from your mouth to avoid exhaled air noise.
7. Push the push-to-talk button and pause before speaking (explain why).
8. Call the dialed unit.
9. Upon termination, use your call sign to let others know you have completed transmission.

Demonstration 2.4.1.S: Transmission of Patient Assessment Information and Telemetry

NOTES

Equipment

Mobile transmitter/receiver (or a simulated replica; either should be identical to the type the students will use)
Telemetry transmitter (or a simulated replica; either should be identical to the type the students will use)
Simulated patient with electrodes attached

Procedures

Position all equipment in front of the class so it is readily accessible.

Position equipment so all students can see.

As the skill is demonstrated, describe what is being done. Specifically, detailed instructions should be provided, including such things as:

- Patient teaching
- Hand position and movements
- Complications
- Critical errors

NOTE: Due to the vast number of manufacturers and modifications of this equipment, the steps below provide only general guidelines for demonstration. Variations in the procedure outlined here are expected to be required.

Steps

1. Turn the unit on.
2. Adjust the squelch.
3. Listen to be sure airways are free of other communciation.
4. Hold the microphone at a proper distance from your mouth to avoid exhaled air noise.
5. Push the push-to-talk button and pause before speaking (explain why).
6. Call the physician (either directly or through a relay system).
7. Connect or attach electrodes to telemetry transmitter.

8. Follow the local standard operating procedures for relaying patient assessment information.
9. Activate the telemetry transmitter for the minimum amount of time required by the receiving physician (approximately 15 seconds).
10. Verify the physician's reception and quality of transmission.

NOTES

Practice Session 1

NOTES

Equipment

Mobile transmitter/receiver equipped with a digital encoder, or simulated duplicate of the type to be used by the students (one for every four or five students)

Portable transmitter/receiver, or simulated duplicate of the type to be used by the students (one for every four or five students)

Telemetry transmitter with connecting cable and electrodes, or simulated duplicate of the type to be used by the students (one for every four or five students)

Skills

2.2.1.S Use of a mobile transmitter/receiver

2.2.2.S Use of a portable transmitter/receiver

2.2.3.S Use of a digital encoder

2.4.1.S Tranamission of patient assessment information and telemetry

Procedure

Divide the class into groups of four or five.

Give each group a set of equipment as described above.

Each student should practice the listed skills.

Student's name _____

Date _____

Pass 1 2 3

Fail 1 2 3

Skill Evaluations 2.2.1.S, 2.2.2.S, 2.2.3.S, and 2.4.1.S: Use of the Mobile and Portable Transmitter/Receivers, Use of the Digital Encoder, and Transmission of Patient Assessment Information and Telemetry

Place an "X" in the appropriate column to indicate the steps that are incorrect, out of sequence, or omitted. The student should be given three attempts to perform the skill.

Equipment

Mobile transmitter/receiver equipped with digital encoder (or simulated duplicate)
Portable transmitter/receiver (or simulated duplicate)
Telemetry transmitter (or simulated duplicate)

Procedure

Have the equipment ready.
Inform the student on what he is to be evaluated.
Give the student an opportunity to practice the skill if he so desires, but inform him that you cannot help him during this practice.
Start when the student is ready.

NOTE: Due to the vast number of manufacturers and modifications of this equipment, the steps below provide only general guidelines for testing. Variations in the procedure outlined here are expected to be required.

NOTES

Steps—Mobile Transmitter Receiver

___ ___ ___ A. Turn on the unit.

___ ___ ___ B. Adjust the squelch.

___ ___ ___ C. Listen to be sure airways are clear

Steps—Use of Digital Encoder

___ ___ ___ D. Select the address code and dial selected numbered code.

___ ___ ___ E. Hold the microphone at a proper distance from your mouth.

___ ___ ___ F. Push the push-to-talk button and pause before speaking.

___ ___ ___ G. Call the selected unit (simulated physician).

Steps—Transmit Patient Assessment Information and Telemetry

___ ___ ___ H. Connect or patch electrodes to the telemetry transmitter.

___ ___ ___ I. Follow the local standard operating procedures for relaying patient assessment information.

___ ___ ___ J. When using the radio:

___ ___ ___ 1. Use an understandable rate of speech.

___ ___ ___ 2. Do not talk too loud.

___ ___ ___ 3. Do not be hesitant.

___ ___ ___ 4. Articulate clearly.

NOTES

___ ___ ___ 5. Speak with good voice quality.

___ ___ ___ 6. Avoid dialect or slang.

___ ___ ___ 7. Do not show emotion.

___ ___ ___ 8. Avoid vocalized pauses.

___ ___ ___ 9. Use proper English.

___ ___ ___ 10. Avoid excessive transmission.

___ ___ ___ K. Activate the telemetry transmitter for the minimum amount of time required (approximately 15 seconds).

___ ___ ___ L. Verify the reception and quality of transmission.

NOTES

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