Chapter 5
EMS Communications

Lesson 5.1
Phases and Roles of Communications
Learning Objectives

- Outline the phases of communications that occur during typical emergency medical services (EMS) event.
- Describe the role of communications in EMS.
- Outline the basic model of communication.
- Define common EMS communications terms.

Learning Objectives

- Describe how to communicate effectively using primary modes of EMS communication.
- Outline the elements of an EMS communications system.
- Describe the characteristics of EMS communications operation modes.

Phases of Communication

- Five phases of communication during an EMS event
  - Occurrence of event
  - Detection of need
  - Notification and emergency response
  - Arrival, treatment, preparation for transport
  - Preparation for next response
Public Safety Answering Point (PSAP)

- Communication specialists receive call
- Call taker sends details to telecommunicator
- Telecommunicator sends response unit to scene

Public Safety Answering Point (PSAP)

- Emergency medical dispatchers or qualified personnel give these instructions
- EMS unit dispatched to scene
- Paramedic crew advises communications center of response, arrival status via radio or computer data terminal

Public Safety Answering Point (PSAP)

- Paramedics render care at scene, package patient for transport
- Patient delivered to facility
- Paramedics complete report, make EMS vehicle ready for next emergency call
Role of Communications in EMS

- Verbal, written, electronic communications
  - Allow information delivery between person in need, telecommunicator, and paramedic
Basic Model of Communications

• Verbal, nonverbal, written
• Serves as vital information function for decision making
• Process by which individuals or groups transmit meaning to others
• Basic model describes relationship between idea, encoding, sender, medium or channel, receiver, decoding, and feedback
• Idea is the meaning intended

Basic Model of Communications

• Conveying idea requires
  – Encoding
    • Sender to organize intended meaning through medium or channel
  – Decoding
    • Receiver provides feedback that the initial idea was received
Common Barriers to Communication

• Attributes of the receiver
  – Personal reasons may affect interpretations of message
  – Cultural differences
  – Language barriers
  – Sensory deficit

What tends to happen to you when you are talking with someone who continually interrupts you?

Common Barriers to Communication

• Selective perception
  – Persons listen to only part of idea, message
  – Values
  – Mood
  – Motives
  – May block idea when new information conflicts with values, beliefs, expectations
Common Barriers to Communication

- Semantic problems
  - Words often have different meanings for different people
  - Vague, abstract words, jargon, or phrases invite varying interpretation
- Time pressures
  - Can lead to distortions in communications
  - Temptation to bypass normal channels
  - Immediate demands of situation are met, can cause confusion later

Proper Verbal Communications

- Role of proper verbal communications
  - Exchange system, patient information with response team
  - Use local protocol, patient privacy standards, regulations
  - Terms conveyed in clear, short narrative form

Proper Verbal Communications

- Many radio, phone communications recorded
  - May be replayed
  - Patient care
  - Audits
  - Media broadcasts
  - Disciplinary hearings
  - Legal proceedings
Proper Written Communications

- Written documentation
  - Provides legal record of event
  - Conveys clinical information from EMS to emergency department
  - Expected as part of professional work
  - Permanent part of patient record
  - Medical audit

Proper Written Communications

- Written documentation
  - Quality improvement/management
  - Billing
  - Data collection
  - Research

Proper Written Communications

- Other types of documentation
  - Training, work assignments
  - Call records
  - Vehicle maintenance records
  - Vehicle/equipment cleaning records
  - Drug/equipment inventory records
  - Incident reports
  - Significant exposures to diseases or biological hazards
Technological Advances

• Reduce reliance on traditional communication
• Portable wireless voice, data devices
• Satellite terminals
• GPS

Technological Advances

• Diagnostic devices
• Laptops, handheld computers
• PDAs
• Devices allow for real-time capture, advanced notification, reduction in time to in-hospital diagnosis and therapy
Communications Systems

- Terms specific to industry
- Requirements established by FCC

Simple Systems

- Minimum requirements for radio equipment used by ambulance services
  - Self-contained desktop transceiver with speaker
  - Microphone
  - Antenna
  - Mobile unit
  - Two-way radio with multiple-frequency capability

Simple Systems

- Handheld portable radios capable of contact with base station and data recording
- Portable radio
  - Protects crew
  - Aids in optimal care
  - Allows continued contact with communications center
  - Medical direction
Simple Systems

- Data recording part of device is on dispatch or hospital radio or telephone
  - Offers medical, legal protection for service
  - Can verify transmissions when contact is disrupted

Complex Systems

- More advanced radio communications systems
  - Remote consoles
  - High-power transmitters
  - Repeaters
  - Satellite receivers
  - High-power multifrequency vehicle radios

Complex Systems

- Some services also use
  - Mobile transmitter steering
  - Vehicular repeaters
  - Mobile encode-decode capabilities
  - Mobile data terminals
  - Microwave links
  - Other sophisticated devices
Complex Systems

• Base stations
  – Located on hills, mountains, tall buildings
  – Ensure optimal transmission, reception with antennas
  – Generally connected via telephone lines to dispatch centers
  – One dispatch center may be responsible for all fire, police, EMS communications activities

Complex Systems

• Mobile transceivers
  – Vehicle-mounted transmitters
  – Operate at lower outputs than base stations
  – Provide range of 10 to 15 miles average terrain
  – Transmission over flat land, water increases range
  – Transmission over mountains, dense foliage, urban areas decrease range
  – Transmitters with higher output available, offer greater ranges
  – Multichannel units preferred over single-channel radios due to many channels used in EMS system

Complex Systems

• Portable transceivers
  – Handheld devices
  – Used when working away from emergency vehicle
  – Limited range
  – Signal boosted through mobile repeater
  – Single-channel or multichannel units
Complex Systems

• Repeaters
  – Act as long-range transceiver
  – Receive transmissions from low-power portable or mobile radio on one frequency
  – Simultaneously retransmit at higher power on another frequency
  – Fixed or vehicle mounted or both
  – Needed for large geographic areas

Complex Systems

• Repeaters
  – Increase coverage from portable/mobile to portable/mobile units
  – Allow low-power units to receive other radio messages
  – Allow two or more low-power units to communicate with each other when distances or obstructions hinder communication

Complex Systems

• Remote console
  – Most EMS systems use dispatch services located away from base stations
  – Remote centers control all base station functions
  – Connected via dedicated phone lines, microwave, other radio means
  – Dedicated hospitals equipped with terminal that receives, displays telemetry transmissions
  – Console provides contact with paramedic crews in field
Complex Systems

• Satellite receivers and terminals
  – Used depending on terrain
  – Used to ensure low-power units always within coverage
  – Strategically located, connected to base station or repeater by dedicated phone lines, radio, microwave relay

Complex Systems

• Satellite receivers and terminals
  – "Voting systems" automatically select best audio signal
  – Commonly available satellite terminals incorporate ground and transportable stations
  – Provide voice, data, video communications
  – Portable satellite terminals useful when other systems are not available

Complex Systems

• Encoders and decoders
  – Selective call encoders, devices that look like phone dial
  – When activated, encoder transmits tone pulses over air
  – Receivers with decoders recognize specific codes that in turn open audio circuits of receivers
  – Two-tone sequential paging alerts personnel using two pairs of specific frequency tones to address pagers, alert monitors selectively
  – Selective-address system has code for calling all units within radio range (all call)
Complex Systems

• Cellular telephones
  – Alternative to dedicated EMS communications systems
  – More channels available
  – Offer secure link between EMS workers and area hospitals
  – Allow online physicians to speak directly with patients

Complex Systems

• Cellular telephones: disadvantages
  – High network usage might limit channel access, especially during disasters
  – Lack of priority access
  – Inability to monitor calls by other members of emergency response team
  – Agencies have backup radio communications capabilities

Complex Systems

• Digital
  – Digital phones
  – Telemetry
  – Fax transmissions
  – Digital signals used in wireless phones
  – Paging
  – Alerting systems
  – Telemetry, facsimiles transmitted using electronic signals
  – Signals are displayed or printed
Complex Systems

- Computer
  - Technology has potential to “save” data entry steps
  - Documentation in near real time
  - Can sort information
  - Can create multiple reporting formats
  - Quick online, retrieval system, data access
  - Terminals sometimes used to dispatch units automatically to scene
  - Subject to human error, machine limitations
  - Requires regular upgrades, user education

Operation Modes Used

- Simplex
  - Requires transmitter, receiver at each end of communications path
  - Operate on same frequency
  - One end operates at a time
  - Allows messages sent without interruption
  - Slows communication process
  - Takes away ability to discuss case
Operation Modes Used

• Duplex mode
  – Uses two frequencies
  – Allows both parties to communicate at the same time
  – Advantage is party can interrupt to facilitate discussion

Operation Modes Used

• Multiplex mode
  – Transmits telemetry, voice simultaneously from field unit
  – Party can interrupt as needed
  – Voice transmission may interfere with transmission data
  – Most common mode used today
Operation Modes Used

• Trunked system
  – Systems with five or more repeaters that work as a group
  – Each repeater on a different channel
  – System may belong to a single user or be shared by multiple public service agencies
  – Radio transmissions originate, find available repeater in system
  – Computer switches transmission to chosen repeater
  – One fleet captures open channel
  – Advantageous in major metropolitan areas with heavy radio frequencies

What dispatching system do you have in your area?
Lesson 5.2
Components, Functions, Regulations, and Procedures for Communication

Learning Objectives

• Describe the role of dispatching as it applies to prehospital emergency medical care.
• Outline techniques for relaying EMS communications clearly and effectively.

Learning Objectives

• Describe how EMS communications are regulated.
• Distinguish between EMS frequency ranges.
• Outline procedures for EMS communications.
Functions of EMS Dispatch

• Receive and process calls
  – Dispatcher receives, records call
  – Selects appropriate course of action by gathering information about emergency
  – May also provide emergency care instructions
• Dispatch, coordinate EMS resources
  – Directs proper emergency vehicles to correct address
  – Coordinates movements of emergency vehicles

Functions of EMS Dispatch

• Relay medical information between
  – Appropriate medical facilities
  – EMS personnel
  – Fire
  – Police
  – Rescue workers
  – Private citizens
• Channel may be telephone, radio, or biomedical telemetry

Functions of EMS Dispatch

• Coordinate with public safety agencies
  – Provide for communication between public safety units and elements of EMS system
  – Help coordinate services
  – Well-coordinated systems require dispatchers to know location, status, and availability of EMS vehicles
  – Larger systems may use computer-aided dispatching
Functions of EMS Dispatch

- Advanced technology allows
  - Automatic emergency medical dispatch
  - Automatic entry of 911
  - Automatic call notification/request for assistance
  - Automatic interface to automatic vehicle location with or without map display
  - Automatic interface to mobile data terminal
  - Computer messaging among multiple radio operators, call takers, or both
  - Dispatch note taking, reminder aid, or both

Functions of EMS Dispatch

- Advanced technology allows
  - Emergency medical dispatch review
  - Manual or automatic updates of unit status
  - Manual entry of call information
  - Radio control and display of channel status
  - Standard operating procedure review
  - Telephone control and display of circuit status
Dispatcher Training

• Required specialized medical training for EMS and public safety agencies

• Dispatchers trained to
  – Use locally approved emergency medical dispatch guide cards (customized to local protocols and EMS response priorities)
  – Quickly and properly determine nature of call
  – Determine priority of call
  – Dispatch appropriate response
  – Provide caller with instructions to help treat patient until responding EMS arrives

Dispatcher Training

• Base of training in EMS helps telecommunicator understand
  – Functions of EMS system
  – Personnel capabilities
  – Equipment limitations

• Trained with protocols to give prearrival instructions
  – CPR instructions
  – Aspirin administration for coronary event
  – Protocols might mitigate event before arrival of EMS unit

Dispatcher Training

• Variety of dispatching systems, procedures used across the United States
  – Simple call received, ambulance dispatched type
  – Call prioritization, prearrival instructions systems
Call Prioritization System

• Determines what type of assistance is needed for an emergency call
  – May include referring caller to other services
  – Choosing basic life support
  – Advanced life support response
  – Selecting private or public EMS service
  – Determining use of audible and visual warning devices

Prearrival Instruction System

• Prearrival instructions
  – Provide instant help to caller
  – Complement call prioritization process
  – Allow dispatchers to give updated information to responding units
  – May be lifesaving in critical incidents
  – Provide emotional support for caller, bystander, or victim

What are some potential consequences of a dispatching error?
Regulation

• Radio communications
  – FCC develops rules, regulations for use of all radio equipment, frequencies
  – State, local governments may have rules, regulations for radio operations
  – Be knowledgeable about agencies, follow guidelines

Why are these rules and regulations needed for good EMS communications?

Regulation

• Primary functions of FCC
  – Licensing and allocating frequencies
• Establishing technical standards for radio equipment
  – Establishing, enforcing rules
  – Establishing regulations for equipment operations
  – Monitoring frequencies for appropriate usage
  – Spot checking for appropriate license, records
EMS Frequency Ranges

• VHF low band (32–50 MHz), VHF high band (150–174 MHz)
  – Used for public safety radio
  – Assigned strictly for two-way use or one-way paging
  – Normally operate in simplex mode
• Ultra high frequency (UHF)
  – Used in either half duplex, duplex, or multiplex modes

EMS Frequency Ranges

• VHF low-band signals
  – Generally have greatest range, cover a greater distance than VHF high band or UHF
  – Follow curvature of Earth’s surface
  – Subject to noise interference, physical or structural interference
  – May not provide best coverage
EMS Frequency Ranges

- VHF high-band signals
  - Generally have medium range
  - Travel in straight lines
  - Signals more easily reflect around buildings and other structures
  - May provide better radio coverage in some areas

EMS Frequency Ranges

- Special emergency radio services (SERS)
  - 1974, FCC established
  - To be used by EMS, hospitals, school buses, and rescue operations
  - 75 radio channels in group
  - 10 UHF channels designated for medical communications
  - EMS-only communications confined to the 450–470 MHz UHF frequency band and five VHF frequencies
EMS Frequency Ranges

- UHF band signals
  - Generally have limited range
  - More “straight-line sensitive” than VHF high-band signals
  - Ability to reflect or bounce around buildings exceeds VHF high-band signals
  - May be most effective frequency in metropolitan areas
  - Least susceptible to noise interference of three bands
  - Reaches into/out of structures more easily

Public Safety 800-MHz Frequencies

- Growth of EMS/other public service operations resulted in overcrowded frequencies, radio congestion
- 1987: FCC allocated additional bands (821–824 MHz and 866–869 MHz) to SERS assignments
  - Helped resolve some communication problems
  - Generally have limited range, more straight line than VHF high-band signals
  - With use of repeaters, ability to reflect or bounce around buildings exceeds VHF high-band and UHF 400-MHz band
  - Best suited for use in urban areas
Public Safety 800-MHz Frequencies

- FCC established “trunking” requirements
  - Ensures efficiency of 800-MHz band
  - Required five or more repeaters (each on different channel) to work together as a group
  - May belong to single user, or shared
  - When radio transmission is originated, computerized scanning automatically finds available repeater in system then switches all radios in fleet to selected repeater

Public Safety 800-MHz Frequencies

- FCC established “trunking” requirements
  - As one fleet captures open channel, it locks out all other shared system users
  - Prevents interference from other agencies
  - Several groups helped FCC to reorganize management of frequencies for public service operations
  - Goals to improve ability of public service agencies to communicate with each other

EMS Communications Procedures

- EMS systems use standard radio communications protocol
  - Desired format for message transmission
  - Key words
  - Phrases
- Following format aids professional, efficient radio communications
EMS Communications Procedures

- General guidelines for radio communications
  - Formulate message so communications are effective
  - Speak into microphone at 2- to 3-inch range
  - Speak slowly, clearly
  - Enunciate each word distinctly, avoid words that are difficult to hear
  - Speak in normal pitch without emotion
  - Be brief, concise

EMS Communications Procedures

- General guidelines for radio communications
  - Break long messages into shorter ones
  - Avoid codes unless system approved
  - Avoid dialect or slang
  - Advise receiving party upon completed transmission
  - Confirm receiving party received message
  - Always be professional, polite, and calm

Relaying Patient Information

- Standard format of transmission may be developed as protocol for some EMS services
  - Allows best use of communications systems, limits radio air time
  - Physicians can receive details regarding patient’s condition
  - Chance of omitting critical details is decreased
  - Patient information can be reported to hospital or dispatcher by radio or phone
### Relaying Patient Information

- **Radio report components**
  - Brief, concise
  - Unit and personnel identification
  - Description of scene or incident
  - Patient’s age, sex, approximate weight (if drug orders needed)
  - Chief complaint
  - Associated symptoms
  - Brief, pertinent history of present illness or injury

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- **Radio reports components**
  - Pertinent medical history, medications, and allergies
  - Pertinent physical examination findings
  - Level of consciousness
  - Vital signs
  - Neurological examination
  - General appearance and degree of distress
  - ECG results (if applicable)

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- **Radio reports components**
  - Diagnostic findings (e.g., serum glucose)
  - Trauma index or Glasgow coma scale (if applicable)
  - Other pertinent observations and significant findings
  - Any treatment given
  - Estimated time of arrival
  - Request for orders from or further questions for medical direction physician

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Can you think of three reasons why a concise EMS radio report is essential?

The SOAP Format
- Used as memory aid to organize written and verbal patient reports
- Subjective data
  - All patient symptoms
  - Chief complaint
  - Associated symptoms
  - History
  - Current medications
  - Allergies
  - Information provided by bystanders and family

The SOAP Format
- Objective data
  - Pertinent physical examination
  - Vital signs
  - Level of consciousness
  - Physical examination findings
  - ECG
  - Pulse oximetry readings
  - Blood glucose determinations
The SOAP Format

- Assessment data
  - Paramedic’s clinical impression of patient based on subjective, objective data
- Plan of patient management
  - Treatment provided
  - Any requests for additional treatment

Information Exchange Procedures

- Paramedics should repeat all orders received from physician
- Unclear orders should be confirmed
- Repeat all drug orders for confirmation
- Receiving hospital should be informed of significant changes in patient’s status before/during transport

Information Exchange Procedures

- Protect patient’s privacy
- Use proper unit numbers, hospital numbers, names, and titles
- Avoid slang or profanity
- Use echo procedure when receiving directions
- Obtain confirmation that message was received
Information Exchange Procedures

- Give final verbal report to person assuming responsibility of patient at receiving facility
  - Short update if person receiving patient has been following care given
  - If person is not familiar with patient, report should be complete
  - All pertinent information should be conveyed during handoff

Summary

- Communications regarding EMS refers to delivery of information
  - Patient, scene information delivered to other key members of emergency response team

Summary

- Five phases of typical EMS events
  - Occurrence of event
  - Detection of need for emergency services
  - Notification, emergency response
  - EMS arrival, treatment, preparation for transport
  - EMS preparation for the next response
Summary

- Communication is a process by which one person or group transmits meaning to others
  - Sender encodes message that receiver decodes
  - Barriers to communication
    - Attributes of receiver
    - Selective perception
    - Semantic problems
    - Time pressures

Summary

- Proper verbal, written communications allow information delivery between members of emergency team, patient, community
  - Communications should be brief, clear, confidential
- EMS communications include simple and complex systems
  - Simple system includes desktop transceiver and two-way radio
  - Complex systems include high-power communication capabilities

Summary

- Operation modes used in EMS communication
  - Simplex mode permits only one person to talk at a time
  - Duplex mode allows two people to converse at the same time
  - Multiplex mode can transmit telemetry and voice simultaneously
  - Trunked systems use five or more repeaters that provide communication channels in busy systems
Summary

• Functions of effective dispatch communications system
  – Receiving, processing calls for EMS assistance
  – Dispatching, coordinating EMS resources
  – Relaying medical information
  – Coordinating with public safety agencies
  – Some emergency dispatchers provide prearrival instructions for patient care

Summary

• In the United States, the FCC regulates communications over the radio
  – Paramedic must be familiar with regulatory agencies
  – Must follow their guidelines
• EMS frequency ranges include VHF, UHF, and 800 MHz

Summary

• Standard format of transmission of patient information is wise idea
  – Allows for best use of communications systems
  – Allows physicians to receive details quickly about patient
  – Decreases chance of omitting any critical details
Questions?