EMS Subspecialty Certification

2.2.2 Design of System Components

2.4.4 System Status Management

Version Date 2015

Learning Objectives

Upon the completion of this program participants will be able to:

• Discuss the importance of knowing system design and the consequences of poor system design.
• Identify key components of an EMS system.
• Discuss historical documents that have influenced system design.
• Identify essential system measures.
• List key features of High Performance Systems
• List methods of system assessment

System Design 8

Introduction

“If you know one EMS System, you know one EMS System”

• Diverse groups of professionals providing care in every imaginable circumstance

• Knowing your system is key to success
  – Who is providing care?
  – Where are they delivering care?
  – How does EMS fit in the “Big Picture?”

System Design 9
First Hour Quintet

- Diseases where EMS “makes a difference”
  - Out-of-Hospital Cardiac arrest*
  - Severe respiratory difficulty*
  - Severe trauma*
  - Chest pain including ACS
  - Stroke*

*leading causes of death in US

Influences on EMS System Design


Definition

- An EMS system is defined as consisting of those organizations, individuals, facilities, and equipment whose participation is required to ensure timely and medically appropriate responses to each request for prehospital care and medical transportation.
Delivery Models

- Fire Based
- Hospital Based
- Private service
- Third service
- Public Utility model
- Franchise model
- Paid
- Volunteer
- Unionized
- QRS services
- Wilderness
- Disaster Response
- Many more....

Input

Cost of 1 hour of EMS
-75% labor
-25% infrastructure

Output

Assessment
Treatment
Transport

Patient Outcome

Essential System Measures
2.4.4.1 Response Times

• The time it takes for an EMS unit to arrive at a call for service
  – No consistency nationally when clock starts and stops
  – Can start when call received or when unit is dispatched
  – Can stop upon arrival at call address or at patient side
• Response times are one of the three essential measures of an EMS system

• Many systems today use an 8 minute standard
• Based upon survival from v-fib arrest
  – 4 minutes for first responders with BLS and defibrillation
    • 3rd link in chain of survival
  – 8 minutes for ALS
    • 4th link in chain of survival

• This 8 minute standard has never been clearly defined
• Huge variations between start and stop of clock
• Recent studies indicate quicker responses improve outcomes
• Response time standards contribute to significant system costs for deployment
2.4.4.1 Response Times

- Measurement of times
  - Average time delivers poorer service
  - Fractile times better meets patient needs
- Penalties often tied to poor response time reliability
- Better to measure response time intervals
  - Call received until dispatch
  - Dispatch to en route

<table>
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<th>Fractile Response Time Distribution</th>
<th>Raw (%)</th>
<th>Total (%)</th>
<th>Cumulative (%)</th>
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<td>100.00</td>
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</table>
**Unit Hour Utilization**

\[
U \text{ (Utilization)} = \frac{\text{Unit is running calls}}{\text{Unit is staffed}}
\]

- Basic measure of efficiency
  - Optimal: 0.55 - 0.45
  - Average: 0.35 - 0.25
  *Varies urban vs. rural, geography, administrative policies, etc.*
- Poor predictor of quality and cost/transport

**System Design Factors**

- Service Area Definition
  - Population, Geography, Politics
- First Response
  - Value -> Delivered by existing Fire/Police
- Ambulance Service
  - Diverse range of delivery models
  - Set priorities and know expectations
- Medical Oversight

**Effective Medical Oversight**

- Medical oversight
  - Internal vs. External
  - Advisory or Authoritative
  - Scope of authority (Narrow vs. Broad)
  - Funding (Volunteer vs. Funded)
Impacts of Inferior Design

• A poorly designed system working at maximum performance may not meet goals
  – Unequal socioeconomic services
  – Unequal response times
  – No incentive for growth
  – Failure to match right patient with right resources

High Performance System

• Sole provider
• Control center operations
• Accountability
• Revenue maximization
• Flexible production strategy
• System Status Management

2.4.4 System Status Management

• An ambulance deployment model based on anticipation of need
  – No fixed base stations
  – Posting locations based on temporal and geographical patterns of demand
• Rational for SSM
  – Timely transport of emergency and non-emergency patients
  – Manage deployment of resources to meet response time requirements
2.4.4 System Status Management

• System Status Plan
  – Protocol for deployment of system’s unit hours
    • Continuous deployment of units throughout the day
    • Peak load staffing
  – Statistical basis for protocol utilizing historical call volume for each hour of each day of the week
  – Considers geographical barriers
    • Rivers, traffic congested areas, time of day

2.4.4 System Status Management

• Success of SSM is a balance of
  – Adequate coverage of high-volume areas and peak-load periods
  – Adequate coverage of low-volume areas and off-peak periods
  – Concern for employee health, safety, skill, and job satisfaction
  – Concern for economic efficiency and financial stability

Take-Home Points

• System Status Management is a dynamic deployment model of EMS based upon needs.
• Response times are a measure of which EMS success is based with little consistency or science to justify their importance.
System Assessment

- Accreditation
  - Commission on Accreditation of Ambulance Services (CAAS)
  - Commission on Accreditation of Medical Transportation Systems (CAMTS)
  - Joint Commission International (JCI)
- Forward thinking documents
  - National EMS Education and Research Agendas
  - EMS Agenda for the future
- Assessment systems
  - i.e., Baldrige Healthcare Criteria for Performance Excellence

Take Home Points

- **System Design** is part of the EMS core content
  - Medical Oversight of EMS - 30% Test questions
- **Key points**
  - EMS System: Infrastructure + Ambulances + Personnel
  - EMS Measures: Sophistication  Reliability  Efficiency
  - Effective Medical Oversight
  - High Performance Systems