Essential Elements of EMS Systems

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EMS, Disaster Medicine, and
Homeland Security
This is not just a course for a few days...

...this is a relationship...

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Objectives for this Talk

- The Medical Director – who s/he is
- Levels of Technicians
- Protocols and standing orders
- Ambulance Equipment
- Risk Management Devices

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The Dallas-Fort Worth Numbers

- 1500+ Fire and Municipal Medics with Central On-line Medical Command in Dallas
- 18 Cities
- 350,000 +/- Responses
- 150,000 + transports
- 120,000 + non-transports
- 3,000+ Cardiac arrests
- And...we are AWASH in BLS calls!!!
My Job

- Policies, procedures, protocols
- Handle problems
- Interview new hires
- Oversee education, especially CE and remediation including Web-based
- Set up and manage IT systems
- Budgeting and finance
- Manage infrastructure for EMS research
The Advent of a New Era

- Capnography and alternative airways
- Real-time Telemetry projects
- Compressions only CPR or “CPR first”
- Decreasing Assisted Ventilation Rates and Tidal Volumes for Patients in Circulatory Collapse
- Adult Tibial Intraosseus
- Electronic PCR’s & the opportunities!!

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The Evolving Scope of EMS

- They used to call us for a ride
- Now they’re calling us for an exam, to get checked out, to receive some services, and they’ll decide if they want further evaluation and care or not
- How do we deal with this evolution?
The EMS Medical Director must become familiar with the individual physical elements of EMS systems.

- Establish protocols and parameters
- Focus on the specifics
- Constantly look and evaluate
Little formal training is generally available for the EMS physician to gain this knowledge:

Medical Director Course and Practicum 1989
The EMS Medical Director

- Comes from all walks of medicine (EP, FP, GP, IM, Surgery, Peds, etc.)
- Formal training in many residency programs and fellowships
- Almost all EMS-P’s learn by OJT
- “Would you mind being the ‘medical director’?”

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The EMS Medical Director

- Authorizes Technician Practice
- Responsible for medical policy and procedure
- Authorizes Protocols and Standing Orders
- Authorizes the drug box
- Consultative
- Quality Assurance and Risk Manager
- Medicolegal Consultant
- ??? Work comp physician?

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The Medical Director

- Responsible for examining the practice of EMS in the locale, state, nation, and elsewhere
- Responsible for relating the care available elsewhere to the local system as is applicable and feasible
- **Alabama Example**: Equipment, training, protocol, hospitals
The EMS Medical Director

- Does NOT give approval to the budget in most circumstances
- Does NOT dictate care nor actually provide the clinical practice, except in certain on-scene incidents or in some countries

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The EMS Medical Director

Must be VERY CAREFUL if a decision is made to limit the practice of a professional.
The EMS Medical Director

- Manages by love and persuasion
- Leads by example, including hard work
- Speaks softly and carries a well-padded hammer, helps to soothe conflict
- Earns authority, and only after years
- Does NOT walk in to the EMS environment and have instant credibility
The EMS Medical Director

Does NOT walk into the EMS environment and have instant credibility
The Medical Director

What IS the EMSP’s “hammer”? PATIENT WELFARE

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Whining does NOT work!
The EMS Medical Director

*Question:* Do medics function as an extension of the license of the medical director?

*Converse question:* Are medics independent practitioners who contract out to a medical director to meet state licensing requirements and for quality assurance purposes?
The Medical Director

Basic Life Support: “Prehospital care that doesn’t need a doctor’s order”
- Suction?
- CPR?
- Patient assessment?
- AED’s?

Does this MEAN though that BLS doesn’t require physician oversight?
The EMS Medical Director

Does this **MEAN** though that BLS doesn’t require physician oversight?

Does this **MEAN** that BLS doesn’t have to take CE and periodic review?

**Remember the Hammer:**

*Patient welfare!*
Advanced Life Support: Medical care requiring physician orders and physician oversight

- IV fluids?
- ACLS drugs?
- Other drugs?
- Intubation, especially rapid sequence
The EMS Medical Director

- The Protocol Set is Key
- Recreating the wheel
- Assessing the standard

www.biotel.ws
www.atcomd.org/cogs.htm
History

The Experience from war

SPECIAL CONTRIBUTIONS

HISTORICAL BACKGROUND TO ACCIDENTAL DEATH AND DISABILITY: THE NEGLECTED DISEASE OF MODERN SOCIETY

John M. Howard, MD

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History

✧ Evolving strategies for severe trauma
The only requirement for an ambulance in the 1950s was that the vehicle permit the patient to lie down. There were then 12,000 ambulance services in the United States, 50% of which were run by morticians. One could almost imagine a conflict of interest.
History

- National Academy of Sciences Study
- Publication in 1966 of
  “Accidental Death and Disability: The Neglected Disease of Modern Society”
History

- Manpower
- Training
- Communications
- Transportation
- Facilities
- Critical care units
- Public safety agencies

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History

- Consumer participation
- Access to care
- Patient transfer
- Coordinated patient record keeping
- Public information and education
- Review and evaluation
- Disaster plan
- Mutual aid
1200 Series of Grants

Federal entitlements to build EMS systems all across the country

Hundreds of millions of dollars

What was the result?
EMS Agenda for the Future 1996

- Emergency Medical Services (EMS) of the future will be community-based health management that is fully integrated with the overall health care system.

- It will have the ability to identify and modify illness and injury risks, provide acute illness and injury care and follow-up, and contribute to treatment of chronic conditions and community health monitoring.

- This new entity will be developed from redistribution of existing health care resources and it will be integrated with other health care providers and public health and safety agencies.

- It will improve community health and result in a more appropriate use of acute health care resources.

- EMS will remain the public’s emergency medical safety net.
Training

- EMT-B, or "Basic EMT"
- EMT-P, or "Paramedic"
- "Certified" as opposed to "Licensed"
- Basic life support (BLS) without physician orders

(Advanced life support (ALS) procedures require physician orders)
EMT-B

- Authorized to perform BLS level procedures
- Some states allow EMT-B to use IVs, Combitube, assist with meds
  - Thus, EMT-B is not necessarily synonymous with BLS
  - Tiered systems? How to do it?
Basic fundamentals of life support
- CPR, splinting, hemorrhage control, communications, vehicle utilization, etc.

Hours of training
- Variable from 110 to over 300 hours

U.S. Dept. of Transportation Curriculum

Certification at state level
EMT-P

U.S. Dept. of Transportation Curriculum

-states must establish this curriculum as their own by legislative or regulatory mandate

May include college degree in "Paramedicine"

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EMT-P

- Most sophisticated level of prehospital care
  - IV
  - Intubation
  - Respiratory support
  - Drug Therapy
  - 12 Lead EKG Interpretation
  - Capnography!!

- Other skills taught in the program, approved by state, and authorized by the Medical Director

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Other EMT Levels

- First Responder
- EMT-D (Manual)
- EMT-AED
- EMT-I
- EMT-IV
- EMT-CT
- EMT-CC
- “Mobile Intensive Care Specialist”
The Changing Scope of Practice

NHTSA project 2006 - 2007: The "Advanced Scope of Practice" Project

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NATIONAL EMS SCOPE OF PRACTICE MODEL

THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
Training and Retraining

- Initial Field Orientation
- Monthly/Quarterly/Periodic Review
- Review for Cause
- Annual Skills Review

### Annual Skills Evaluation

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Signature of Employee:  
Signature of Instructor:

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Training and Retraining

- What procedures should be covered in periodic retraining when?
- Established schedule
- Focus on Higher risk / lower frequency
- Results of the QA plan
Training and Retraining

- How often to reverify ET tube technique?
- Rapid Sequence Intubation retraining
- How about cricothyrotyotomy?
- Intraosseous?
- Splinting?
Training and Retraining

- And...how much training is enough for a new-hire?
  - None?
  - A week?
  - Two weeks?
  - 13 weeks?

- Medstar in Fort Worth and Austin-Travis County
Standing Orders

- Authorized by the medical director
- Provides protocols by which medics can recognize various emergencies and treat them, including certain ALS procedures
- Obviates the need to call in for permission for a select group of invasive procedures

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Standing Orders

- Candidate procedures for S.O.’s
- D-50 for hypoglycemia
- Certain ACLS algorithms including drugs
What about RSI?

Do you have RSI in your system?

If so, have you compared your results to those of Dunford et al in San Diego?

What are the minimum standards for training, retraining, and monitoring?

Is it a standing order?
Standing Orders

- The authorization of standing orders by the Medical Director
  
  ...BUT the failure of Medical Director to exercise due diligence in the monitoring of the application of these Standing Orders by the medics...

 IS NEGLIGENCE!
Can you turn a system loose with RSI without applying the same analysis criteria of its utilization that San Diego did? (which, by the way, caused them to remove RSI from their system...prolonged time to intubation increasing mortality)
Has been shown to change hospital outcome very little in some studies

*Davidson, et al, 1987*
What is the right way to do the triage exam?
Disaster Management

★ Business as Usual!!!
**S.T.A.R.T. Method**

B (rate) – No – Reposition = No - Black

Breathing fast or slow- Red

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THEN, if breathing OK

C (rate and CRT)

Absent pulse - Red

Delayed CRT - Red

|  |

Mental - Good = yellow   Bad = Red
BDLS/ADLS MASS Triage

Green Screen

Yellow Filter

Red Surveys
Someone able to walk out may indeed be an “IMMEDIATE” Ambulatory Patient.
None reposition (if none = BLACK)

Bad = Red

Bad or Absent = Red

Mental

Breathing

Circulation
Questions?
Comments?
Bowel Gas?
you think you got problems, huh?
The initial focus of organized EMS was toward the provision of communication between the patient and public responders as well as between the field and the hospital. 

- > EMS Systems Act 1973
Communications Needs

- Consumer request for assistance
- Dispatch
- Medic to supervisor
- Medic to direct medical control
- Networking, including interagency coordination
Communications Methods

- Radio frequencies
- Conventional telephone
- Cellular telephone
- Satellite
- Mail sent by courier
VHF Low Band

- 32-50 MHz
  - Long range, low penetration, skip and noise
- Few channels
- No telemetry
- No duplex

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VHF High Band

- 150-174 MHz
  - Good range, low penetration, less skip and noise, smaller antenna
- The “Hear System”
- Crowded, gets “walked on”
- Few channels
- No telemetry
- No duplex (“shut up already”)

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UHF Band

- 450-470 MHz
  - "Med" frequency, shorter range, good penetration, little interference, small antenna
  - Many channels
  - Telemetry available
  - Duplex available

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800, 900 Trunking Systems

- **800 or 900 MHz FM**
  - Very short range, excellent penetration, little interference, small antenna, repeaters needed
- Many channels (can be shared)
- Data transmission / computer interface available, including FAX
- Expensive, usually major municipal purchase

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Microwave

- Straight line communications from remote radios
- Multiple transmitters required
Cellular

- Mobile telephones - flexibility
- Little distortion
- Needs presence of "cells" to work
- Non-dedicated frequencies
- Cheap
- Problematic use in disaster

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Blackberry

- Seem durable in disasters
- Very fast, as fast as cyberspace
- A record of communications
- Keeps a group informed
Direct Telephone Communication

- Most common method of calling for help by:
  - Patients
  - Other agencies
Enhanced 911 System

- Central answering agency (rapid access)
- Provides automatic caller location and phone number identification
- Usually dispatches directly (not always)
- May control multiple agencies
Ring down, land line, radio and alphanumeric beeper use common

Pre-arrival instructions:
- “The Standard of care”
- Emergency Medical Dispatcher (EMD)
Medical Control

- VHF high band, UHF, or 800 trunking
- Cellular becoming more common though often problematic

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Does On-Line Medical Control Make a Difference?

“Critical Care Consult”
Real-time QA
Destination
Protocol expansion
No Loads
Homeland Security Issues
“Resource alert”
Could On-Line Medical Control Make MORE of a Difference?

The Real-time Evaluation and Management of Critically Ill Patients, especially long transport times
For What?

- Complex Clinical Scenarios
- Difficult ECG Rhythms
- Assistance in Patient Monitoring
- Destination Decisions
- Assistance with Non-Transports

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...and, to bring a reality check

Name: [Name]
ID: 2004-D13112245200
1/31/2004
Patient ID
Incident ID
Age: 41
Sex: [Sex]
P-QRS-T Axes: [Axes]

12-Lead ECG:
- HR: 163 bpm
- PR: 0.000s
- QT/QTc: 0.274s/0.451s

Additional Information:
- *** ACUTE MI SUSPECTED ***
- Abnormal ECG **Unconfirmed**
- Undetermined rhythm
- Inferior-posterior infarct, possibly acute T wave abnormality, consider lateral ischemia

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Interoperability and Open Architecture

Allows others to work with your hardware and software (Windows and the PC)

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Disaster

- Must be multiple methods
  - Reduce chance of communications system failure
- Non-essential utilization must be suppressed
Transportation Sector

13. January 4, USA Today – (National) Passenger jets get anti-missile devices. Tens of thousands of airline passengers will soon be flying on jets outfitted with anti-missile systems as part of a new government test aimed at thwarting terrorists armed with shoulder-fired projectiles. Three American Airlines Boeing 767-200s that fly daily...
~40,000 service population
~10,000 patients in 4 weeks
~250 admitted to hospital
Ambulance Equipment
The ambulance is a mobile medical care facility which must be broadly equipped with devices and supplies to be used in the evaluation and management of patients.
Type of Problem

- Usually unknown
- General allocation of supplies and devices for majority of problems that may be encountered.
Cushioned seat against wall at patient's left

- Permits multiple attendants or patients' significant others to sit

Headroom

- May stand semi-upright
- CPR is one-handed
Wall mounted storage and equipment
- General supplies
- \(O_2\)
- Monitor-Defibrillator
- Radio(s)
Layout

- Accessory Cabinets
  - Spine boards
  - Splints
  - Rescue materials and devices

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Layout Variations

- Hearse
- Type I Modular Truck (no walk-thru)
- Type II Modular Van
- Type III Modular Van (with walk-thru)
- Multi-passenger bus
- Specialty interhospital transport units
Performance

The ambulance is a truck, not a high speed vehicle

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Truck Concept

- Speeds > 70 m.p.h. are dangerous
- Traffic laws must be obeyed
- Adhere to restrictions from weather and road surface conditions
- Drive with Due Regard

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Truck Concept

- Accelerate and decelerate gently
- NO tight turns
- Fatigue on engines and chassis can be decreased
- Miles driven under aggressive conditions
- Rough handling (acceleration, deceleration, tight turns)
- “Pinging” by GPS for speed and location

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DEFENSIVE DRIVING IS ESSENTIAL

EVO Course highly recommended!!!
Respiratory Equipment

- Oral and nasal airways
- Esophageal airways
- NG tubes
- Bite sticks, tongue depressors
Respiratory Equipment

- Suction™
  - Electric or manual
  - Portable and on-board
  - Yankauer and flexible

- Pulse Oximetry
- End-tidal CO2 Capnometry
- Esophageal intubation detector
Respiratory Equipment

- Oxygen: Both on-board and portable
- O2 delivery devices
  - Nasal cannula
  - Simple face mask
  - Venturi (24-50%)
  - Partial and Non-rebreather masks
The era is over when we can justify not knowing whether an endotracheal tube is in place or not.

We may not be able to intubate everybody, but we must ALWAYS know if the tube is in place or not.
Which alternative airway?
Respiratory Equipment

- Aerosol devices
- Humidity devices
- Pocket mask
- Bag-valve-mask
- O2 powered ventilatory assist device: CPAP or BiPAP?
Respiratory Equipment
Circulatory

- IV catheters
  - Conventional and Seldinger
- Monitor / Defibrillator
  - Automatic external defib (many BLS, first responder, police, and other units)
  - External pacers
  - Synchronized cardioversion capability
  - 12 Lead Capability? Transmit 12 leads?
  - Biphasic or Monophasic?
Circulatory

- **IV fluids**
  - D5W??
  - Saline
  - LR?
  - Colloids??
- **Future:** HBOC and Hypertonic Saline???
Circulatory

- Pressure infusion pump
- Controlled rate/volume infusion device
- Automatic ventilation/compression device
- *Is the Autopulse proved yet?*
Orthopedic

- Cervical immobilization devices
- Short board / KED / Reeve sleeve
- Long board
- Scoop
General

Drug box
- Antiarrhythmics: Amiodarone - $4.00
- Nitroglycerin
- Vasopressors
- Seizure control
- Pain control / sedation
- Inhaled analgesia
- Nebulized bronchodilator
General

- OB kit
- Blood sugar measurement
- Poison antidote kit?  Charcoal?
- Snake bite kit
MAD® Nasal
Nasal Drug Delivery Device

Fast and effective
for heroin overdoses, seizures and sedation

Reduces pain and bleeding
associated with nasal and oral instrumentation
and nasogastric tube placement

Controlled delivery

Reliable atomization of topical solution across the nasal and oropharyngeal mucous membranes.

No needies
- No needlestick risk
- Less frightening for children
- Disposable

Complete control - You choose
- Medication
- Exact dosage
- Exact volume
- Delivery target

Consistent, reliable spray every time!
- Fine mist-like spray
- Targets desired mucosal region

Works in any position
- Semi-permeable soft plug absorbs runoff
- Contoured tip designed for adult and child's nose

All MAD® products are:
- With luer lock connection
- Individually packaged clean
- Available with or without 3 mL syringe
- Latex-free

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<th>Specifications</th>
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<tr>
<td>Tip diameter</td>
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<td>Applicator length</td>
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How do we ADD New Stuff???

- Check it out...
- Check it out...
- Check it out...
- Check it out...
- Look for data...
- Make it make sense to you and all of the players
- Try “Pilot Projects” with CAREFUL monitoring

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The computerization of medicine has provided unprecedented assistance in areas such as:

- Information resources
- Data tracking
- Communications
Dispatch

- Computer-Aided Dispatch (CAD)
  - Emergency Medical Dispatch!!
  - The standard of care!!
Medical Control and PCR’s

- Computer data entry of patient care reports (PCR)
- Analysis of PCR
- Analysis and critique of EMS practice
- Direct feedback to the Continuing Education Program

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Records

- Electronic PCR’s are changing life as we know it in EMS Medical Direction –

  “every no-load by A shift from last Thursday for chest pain above the age of 35 that didn’t get a 12-lead ECG with no call to online medical control”
Ambulance Run Sheet

Incident Location: ________________________________  Date: / /  Incident #: -

Patient Name: ___________________________________  Address: _______________________________________________  DOB: / /  Sex: ______  Race: ______

Subjective Hx:______________________________________________________________________________________________

Objective - Primary Survey Findings:
Scene survey: initially ___ unsafe  Hazards: ___________  % of patients: ___________  Injury mechanism: ___________

Pulse ox attached: Y  N  Airway (w/c-spine control): Open  Maneuver  Suction  Respiratory rate: ___________  normal  shallow  labored  Carotid pulse: Y  N


JVD: absent  present  Tracheal deviation: midline  deviated  R  L  Chest for CLAPD: unremarkable  remarkable

Breath sounds: present  absent  bilateral  R  L  MAST exam/back: unremarkable  remarkable

Load and Go: Y  N  Total Scene minutes: ___________

Secondary Survey Findings:
Measured pulse: ______  Resp rate: ______  BP: ______/______  Glucose level: ______mg%  Peak flow: ______  EKG:

Papils: size, reactivity R  L  Head: unremarkable  Airway: unremarkable

Breathing: unremarkable  Circulation: unremarkable  Neck: unremarkable

Chest: unremarkable  Upper extremities: unremarkable  Lower extremities: unremarkable

Abdomen: unremarkable  Pelvis: unremarkable

GCS: Eyes spontaneous 4  Verbal oriented 5  Motor obedience 6

Allergies: ___________________________________________

Medications: to pain  2  inappropriate  3  withdrawal  4  pertinent past medical

Last meal: none  1  Total GCS = ______

Third Survey Findings:
LOC: A  V  P  U  Airway: open  compromised  Breathing: adequate  assisted  labored  Pulses: present  absent  unchanged  JVD: absent  present

Tracheal deviation: midline  deviated  R  L  Breath sounds: unchanged  changed

Assessment:______________________________________________________________________________________________

Plant: Tx/Procedure  Dose/Rate/Route  Time (all are estimated)  Medi #  If invasive, success Y or N & # attempts, response to therapy

Orders: Requested  Denied  Standing Order  Physician signature
Search on tachypnea, shock, altered LOC, and **no oxygen given**

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Available Software Approaches

- MEDUSA/Lifenet EMS/Siren from Medtronic
- RescueNet/Tablet PC from Zoll
- ESO Solutions
- ROAM – IT
- Image Trend
- Intermedix
- Safety Pad
- Rescue Medic
Medical Control and PCR's

Electronic medical record is the holy grail of EMS (along with capnography and the intraosseous device and avoiding over-ventilation).

---

**Patient Care Report**

**Incident Number:**

**Date of Service:** 12/08/2007 01:11:02

**Chief Complaint:** Cardiac

---

**Report: ROC Study**

**Report Date:** 1/7/2008 11:46:34 AM

**Start Date:** 12/31/2007

**End Date:** 1/7/2008

---

**ROC Summary**

**Total ROC Runs for 12/31/2007 - 1/7/2008:** 64

**City Runs (64) | Details**

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**Signatures**

Fowler, MD

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The following list of PCR's belong to Record Auditor - New Groups with Batch Numbers: 200607-03.

Previous | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Next  
Showing Records From 1 - 25 of 470 (Page 1 of 19)

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What ELSE can you capture?

- Every single heartbeat on every patient put onto a monitor
- Every single heartbeat on every patient put onto a monitor
How do you do that?

- Incorporate the monitor file directly into the ePCR (many vendors, requires a software development kit)
- Download the file in the station to a PC
- Download the file to a laptop in the rig and stream it wirelessly to a server, matching the file up with the PCR file later (cellular card, station router, municipal router)
Ambulances

- Computers are commonly prevalent in driver compartments for mapping and mobile data terminals.
- Real-time telemetry pilot project in Dallas, Texas.
Initial and Continuing Education

The quality of education is undergoing a HUGE boost due to such resources:

- [www.utsw.ws](http://www.utsw.ws) streaming Flash® lectures
- [www.emergencymedicine.ws](http://www.emergencymedicine.ws) library of material

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a little closer.... closer...
Summary Thoughts
Can you make it make sense?

Will you leave a “lasting” impression?

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The Medics of the Near Future will be “Out of Hospital Intensivists”

BP = 88/55
P = 160
Resp = 36
TV = 800
Glu = 425
Hgb = 9
Summary Thoughts

- Framework
  - Personnel
  - Ambulances
  - Communications
  - Computers

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Using such a framework, the EMS physician can most accurately establish and maintain the practice of EMS medicine in the best interests of the patients and of the providers.
Again, this is not just a course for a few days...

...this is a relationship...

“drray@doctorfowler.com”

www.rayfowler.com

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