The future of Emergency Medicine

Models of Emergency Medicine in the world

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European Society of Emergency Medicine (EuSEM)
No conflicts of interest except ...
EMS & EM & EMTs & EPs

*Myth: “Emergency care is expensive”*

• Definitions:
  – EMS (Emergency Medical services) is the emergency care in the pre- or out-of-hospital setting by
    • EMTs = Emergency Medical Technician
    • Paramedics = highest level of EMT
      – Levels *vary* within and between countries!
      – Up to 5 years of training
    • Nurses or doctors

  – Working on ambulances, helicopters

HEMS : Helicopter Emergency Medical Services (UK, HK, Germany, Canada, France, Japan, Australia,...)
EM & EMS

In many countries Emergency Medicine is EMS

– Physicians are on ambulances
  • But are these really Eps?

– And subspecialists are in the ED
  • (eg surgeons, pneumonologists etc) see their own patients in a common ED or in separate specialty specific receiving areas
  • They are not really emergency physicians!
What is the objective of EMS?

1. Life-threatening injuries are appropriately treated, promptly to maximize survival

2. Potentially disabling injuries are treated appropriately to minimize functional impairment

3. Minimize Pain and psychological suffering
Prehospital Care

Varies from country to country
Should be linked to Health Facilities

Transport

When pre-hospital transportation is poor or absent, deaths that could have been prevented occur

Emergency Department

When quality of care is poor, communities may be discouraged from promptly taking patients even when the capacity exists to transport patients
The 2 General Types of EMS Systems

<table>
<thead>
<tr>
<th>&quot;Anglo-American&quot; system</th>
<th>&quot;Franco-German&quot; system</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Scoop and Run”</td>
<td>“Stay and Play”</td>
</tr>
<tr>
<td>Prehospital care by paramedics</td>
<td>Prehospital care by Emergency physicians</td>
</tr>
<tr>
<td>Patients delivered to hospital-based AED staffed by EP</td>
<td>Patients delivered directly to inpatient services (ACS, Stroke, MultiTrauma..)</td>
</tr>
<tr>
<td>&quot;Bring the patient to the doctor&quot;</td>
<td>&quot;Bring the doctor to the patient&quot;</td>
</tr>
<tr>
<td>May just transfer problems to the nearest hospital ?</td>
<td>May take more time on–the-scene ? Cost +++</td>
</tr>
</tbody>
</table>

Mix the 2 systems ! “Stay Treat ...and run !”

models in Europe: Franco-German (60 %) vs Anglo American (30 %)
Countries Utilizing the "American-Anglo" EMS System Type

- U.S.A.
- Canada
- United Kingdom
- Ireland
- Australia
- Hong Kong
- Mexico
- South Korea
- Iran
European Countries Physicians Provide most Prehospital Care

- France
- Germany
- Austria
- Russia
- Ukraine
- Italy
- Spain
- Poland
- Estonia
- Croatia
- Slovenia
- Switzerland
- Hungary
- Czech Republic
- Slovakia
- Portugal
- …
Cardiovascular diseases
Top N°1 in the world

17.5 Million people killed by cardiovascular diseases
7.4 million people died / ischaemic heart disease
6.7 million people died / stroke.

in 2012
Globalization of need for EMS

Table 3: 30 leading causes of death worldwide in 1990

<table>
<thead>
<tr>
<th>Rank</th>
<th>Cause of deaths</th>
<th>Number of deaths ($\times 10^6$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ischaemic heart disease</td>
<td>7.4 million</td>
</tr>
<tr>
<td>2</td>
<td>Stroke</td>
<td>6.7 million</td>
</tr>
<tr>
<td>3</td>
<td>COPD</td>
<td>3.1 million</td>
</tr>
<tr>
<td>4</td>
<td>Lower respiratory inf...</td>
<td>3.1 million</td>
</tr>
<tr>
<td>5</td>
<td>Trachea, bronchus, and lung cancers</td>
<td>1.6 million</td>
</tr>
<tr>
<td>6</td>
<td>Malaria</td>
<td>1.5 million</td>
</tr>
<tr>
<td>7</td>
<td>Diarrhoeal diseases</td>
<td>1.5 million</td>
</tr>
<tr>
<td>8</td>
<td>Diabetes mellitus</td>
<td>1.5 million</td>
</tr>
<tr>
<td>9</td>
<td>Hypertensive...</td>
<td>1.3 million</td>
</tr>
<tr>
<td>10</td>
<td>Road injury</td>
<td>1.1 million</td>
</tr>
<tr>
<td>11</td>
<td>All causes</td>
<td>0.856 million</td>
</tr>
<tr>
<td>12</td>
<td>Ischaemic heart disease</td>
<td>0.786 million</td>
</tr>
<tr>
<td>13</td>
<td>Cerebrovascular disease</td>
<td>0.779 million</td>
</tr>
<tr>
<td>14</td>
<td>Lower respiratory infections</td>
<td>0.752 million</td>
</tr>
<tr>
<td>15</td>
<td>Congenital anomalies</td>
<td>0.589 million</td>
</tr>
<tr>
<td>16</td>
<td>Diabetes mellitus</td>
<td>0.571 million</td>
</tr>
<tr>
<td>17</td>
<td>Insulin-dependent diabetes</td>
<td>0.563 million</td>
</tr>
<tr>
<td>18</td>
<td>Tetanus</td>
<td>0.542 million</td>
</tr>
<tr>
<td>19</td>
<td>Neoplasms</td>
<td>0.536 million</td>
</tr>
<tr>
<td>20</td>
<td>Drowning</td>
<td>0.504 million</td>
</tr>
<tr>
<td>21</td>
<td>War injuries</td>
<td>0.502 million</td>
</tr>
<tr>
<td>22</td>
<td>Liver cancer</td>
<td>0.501 million</td>
</tr>
<tr>
<td>23</td>
<td>Inflamed heart disease</td>
<td>0.495 million</td>
</tr>
<tr>
<td>24</td>
<td>Colon and rectum cancers</td>
<td>0.472 million</td>
</tr>
<tr>
<td>25</td>
<td>Protein-energy malnutrition</td>
<td>0.372 million</td>
</tr>
<tr>
<td>26</td>
<td>Oesophagus cancer</td>
<td>0.358 million</td>
</tr>
<tr>
<td>27</td>
<td>Pertussis</td>
<td>0.347 million</td>
</tr>
<tr>
<td>28</td>
<td>Rheumatic heart disease</td>
<td>0.340 million</td>
</tr>
<tr>
<td>29</td>
<td>Breast cancer</td>
<td>0.322 million</td>
</tr>
<tr>
<td>30</td>
<td>HIV</td>
<td>0.312 million</td>
</tr>
</tbody>
</table>
Number of Road traffic death rate

China > 261,000 deaths
India : 207,000
Nigeria : 35,000
US : 34,000
Russia : 27,000
Turkey : 6687

http://gamapserver.who.int/gho/interactive_charts/road_safety/road_traffic_deaths/atlas.html
New: Terrorist Threat

- Adequate preparation
- rapid logistical response
- short transport times
- immediate access to O.R
- methodical multidisciplinary care
- Military Medicine...
1. Care provide in the community until the patient arrives at ED
2. Basic strategies with proven effectiveness
   – rapid transportation
   – Triage
   – prioritize treatment (hypoglycemia, asthma...)
   – transfer
   – mainly by non physicians
   – Invasive procedures (IV fluids, NIV, Intubation..) performed by physicians
## Pre-hospital care resources

<table>
<thead>
<tr>
<th>Pre-hospital</th>
<th>1st Responders</th>
<th>Paramedics</th>
<th>Physicians</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>US, UK, Canada, Ireland, Australia, HK, Mexico..</strong></td>
<td>motivated citizens who are more likely to confront emergency situations</td>
<td>Little literature (Iraq, Cambodia) significant reduction in mortality from injury among populations with a high prevalence of injury</td>
<td>most middle-income countries, and some cities in low-income countries. sub-Saharan Africa and Asia, paramedical personnel (ambulances) are used only to transfer patients between health facilities and not from the scenes of injury or from their homes. There is no evidence to support training paramedics in ALS</td>
</tr>
<tr>
<td><strong>BLS</strong></td>
<td>Using ambulances and equipment BLS</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1 team /50 000 people</strong></td>
<td>1 team /100 000 ART: 10 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Average Response time: 4-6 mn</strong></td>
<td>Mexico:1 team /100 000 ART: 10 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hanoi (Viet Nam) 1 team /600 000 ART: 30 minutes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Physicians</strong></td>
<td>Not always feasible in low-income countries, if trained personnel are few and if make round-the-clock coverage costs are difficult.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>France, Italy, Spain..</strong></td>
<td></td>
<td></td>
<td>Invasive procedures (IV fluids, NIV, Intubation..) performed by physicians do not necessary improve outcome</td>
</tr>
</tbody>
</table>
Ex: management of airways
In prehospital vs in-hospital conditions

ETI in 15,398 pts
2,536 physicians (RSI)
12,862 non-physician

Failed ETI
Physicians 1: 100
Non-physicians 15: 100

<table>
<thead>
<tr>
<th>Prehospital (8%)</th>
<th>ED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac arrest, CPR (30-45%)</td>
<td>Cardiac arrest (10%)</td>
</tr>
<tr>
<td>Neurologic disorders (stroke, status epilepticus...)</td>
<td>Stroke, Status epilepticus (30 %)</td>
</tr>
<tr>
<td>Intoxications</td>
<td>Intoxications (20 %)</td>
</tr>
<tr>
<td>Trauma, polytrauma (10-15 %)</td>
<td>Respiratory distress</td>
</tr>
<tr>
<td>Burns</td>
<td>Trauma (US)</td>
</tr>
</tbody>
</table>

* In the absence of pre-hospital physicians, conducting basic and advanced airway techniques other than ETI should be strongly considered.
On-the scene : pre-hospital Damage Control resuscitation and Tactical Combat Casualty care

- Extraction to safe zone
- External hemorrhage: compression, tourniquets
- Shock with hypotension: objective maintain BP > 60 mmHg
- Antifibrinolytics agents tranexamic Acid= 1g / 20 min
- Waiting position, Control Hypothermia
- Oxygenotherapy, avoid intubation/ventilation
- Limit analgesia
- fastest possible haemostatic surgery

Evacuation to the closer O.R < 60 mn max
Overcrowding a Worldwide problem...
European ED and overcrowding

- University 82%
- Regional 85%
- District 77%
- General 66%
- Private 26%

Triage Protocols
- Standardized (89%)
- MTS at national level (30%)
- Computer recording (35%)
ED Visits per 1000 population / year

Turkey
Canada
USA
England
France
Germany
The Hospital ED must have

1. 24-hour open access to all acute care
2. Robust Triage system
3. Treatment of patients with life threatening situations within 10 minutes.
5. provide for a maximum of 24 hours of care
1. EDs should be staffed with sufficient human resources to provide quality care.

2. Staff numbers based on target (e.g., doctor/nurse per number of patients/population served).

3. Working hours should be divided into day and night shifts of no more than 12 hours.

Synopsis of Consensus Statements on Staffing of EDs in Developing Countries
Specific roles for non physicians in the ED in developing countries

- Triage
- recognition of signs and symptoms in acute situations
- life-saving care in the initial stages
- assisting doctors with procedures
- safe patient transport and movement
- cast placement, suturing of wounds
- nebulization, intravenous access
The Hospital ED must have

1. Treatment including initial management and stabilization, resuscitation of unstable patients
2. Diagnosis
3. Pathway to a specialist center
4. Manage short-term patients to control hospital admissions.
5. Minimize suffering and reduce mortality and morbidity.
MSTUs significantly reduced numerous time intervals along the emergency stroke care continuum in comparison to controls,
• dispatch to door (19min vs. 31min, $p=0.03$),
• door to initial CT (12min vs. 32min, $p=0.01$),
• CT to IAT (82min vs. 165min, $p=0.01$).
Prehospital telemedicine system to support paramedics

Figure 2 Teleconsultation centre and screenshots of workstation. SOP, standard operating procedure.

Table 2 Number of regular and telematically assisted emergency missions

<table>
<thead>
<tr>
<th>District and observation period</th>
<th>Regular emergency missions</th>
<th>Emergency missions with telesistence / teleconsultation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aachen 1 (city) 01.08-31.08.2013</td>
<td>118</td>
<td>22 (18.6%)</td>
</tr>
<tr>
<td>Aachen 2 (rural) 01.08-31.08.2013</td>
<td>75</td>
<td>3 (4.0%)</td>
</tr>
<tr>
<td>Heinsberg (rural) 01.08-31.08.2013</td>
<td>76</td>
<td>6 (7.9%)</td>
</tr>
<tr>
<td>Düren (rural) 20.08-31.08.2013</td>
<td>12</td>
<td>4 (33.3%)</td>
</tr>
<tr>
<td>Euskirchen (rural) 27.08-31.08.2013</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Total number</td>
<td>296</td>
<td>35 (11.8%)</td>
</tr>
</tbody>
</table>

* during operating time of teleconsultation centre: weekdays 7.30 am – 4.30 pm, *b* only technical testing performed.

Sweden

Table 4 Time points and circumstances of teleconsultation initiation

<table>
<thead>
<tr>
<th>Characteristics of teleconsultation</th>
<th>Number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teleconsultation without an on-scene EMS physician</td>
<td>23 (65.7%)</td>
</tr>
<tr>
<td>Teleconsultation initiated while awaiting arrival of an EMS physician</td>
<td>3 (8.6%)</td>
</tr>
<tr>
<td>Teleconsultation initiated in the absence of an EMS physician; EMS physician requested after evaluation of the patient by the tele-EMS physician</td>
<td>3 (8.6%)</td>
</tr>
<tr>
<td>Teleconsultation initiated after arrival of an EMS physician</td>
<td>6 (17.1%)</td>
</tr>
</tbody>
</table>

EMS emergency medical service.

Figure 1 Telemedical equipment on the ambulance. Pneq-box, mobile data and audio transmission unit.

Bergrath et al. Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine 2013, 21 :54 http://www.sjtrem.com/content/21/1/54
Drones Could Be The Next Step Forward In Emergency Medicine

Transportation of SAD weight 4kg
Speed 100 km/h area 20 km2

Italy
Live ECG readings using Google Glass in emergency situations. 

Schaer R
Future Trends of EM

- Integration of ED care with other care resources
- The regionalization of specialized acute care, modeled after the trauma systems
- A greater focus on prevention
- Innovation to enhance quality and value in the ED and across the continuum of care
Predictions for next 10-20 years

– IT and Telemedicine *will* help put us at the bedside
– Increasing deployment of systems to improve diagnosis and reduce errors
– Continued refinement and evolution of technology
– Easier involvement of other specialists in the ED
Summary

• EMS/prehospital care
  – Needs to be organized
    • To deliver a SYSTEM of emergency care
  – Needs to be represented
    • To argue improved care

• EMS/prehospital care
  – needs to do research
  – needs to provide continuing education
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