Emergency Medical Service System in Taipei City

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IN THIS TALK...

- Milestones of Taipei City EMSS
- System configuration and optimization
- Some examples of previous research
EOM in Taiwan: Past, present, and future

Abstract

Taiwan is a small island country located in East Asia. Throughout the 90's, major reform concepts of the EMS were introduced and supported by legislation. Continuous progress has been made towards the construction of an effective pre-hospital care system. This study introduces the current status of the EMS in Taiwan, including the systems, response configurations, funding, personnel, medical delivery, and outcome research. The features and functions of an integrated EMS are also discussed. This paper aims to facilitate development in the country by describing the differences in available resources and population density. An analysis of the strengths, weaknesses, opportunities, and threats of the existing EMS in Taiwan could be an example for other countries about how the EMS is undergoing a process of development and optimization.

Keywords: EMS, pre-hospital, Taiwan, Reanimation.
Public Demand, Taiwan EMS

Annual growth at 10%

1.1 call per 10,000 per day
Area: 2,052.6 km²
Population: 3.85 M
Density: 1,872.7 /km²

12 districts
台北EMS的服務量趨勢

Calls / Services

Taipei City EMS

1.05 call per 10,000 per day
Modern EMS: Milestones (I)

1990
- First official EMT training curriculum (SECCM)

1995
- The Emergency Medical Service Act
- 2000, 2007

1998
- Emergency Medicine as a medical specialty

1998
- Hospital-based ALS and Fire-based BLS team (Taipei City)
- EMT-only EMS squads (Taipei City)
Modern EMS: Milestones (II)

- 1999-2000
  - Medical Direction (TPE)
  - AED use by EMT (Taipei City)

- 2002
  - Trauma system pilot (Taipei City)

- 2003
  - Fire-based ALS team (Taipei City)

- 2007
  - Medical oversight

- 2008
  - Public Access Defibrillation
Taipei City EMS

The money comes from Charities & Temples
Sources & Types of Providers

- All prehospital EMSS in Taiwan are fire-based
- Degree of voluntary involvement varies

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<th>Scope of Practice</th>
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Access to EMSS

- Universal number of 119 (Fire & EMS)
- Central and horizontal dispatch
- Location identification capability (enhanced 119 system) in urban cities
- No triage to alternative source of care; almost all request resulted in ambulance transport
Early Defibrillation - Fire BLS-D, since 2000

- All levels of EMTs authorized to use AEDs since 2000
- All squads in TPEC equipped with AED
- AED implementation varies with jurisdiction
- Public access defibrillation since 2008
**Fire-based ALS**

- EMT-paramedics training started since 2002
- ALS services in few metropolitan cities, firstly in Taipei City since 2003
- Versatile ambulance deployment
- Motorcycle ambulance squads
Two Tiered BLS-D / ALS – Taipei City

Fire-based since 2003

119

Fire ALS

Fire BLS

Fire ALS

Fire BLS
Three ALS squads

81 EMT-P
• 531/2003 OHCA patients (By 3 EMT-P squad), in 2008
  • 0-2min  56 Cases (10.5%)
  • 2-4min  143 Cases (26.9%)
  • 4-6min  129 Cases (24.3%)
  • 6-8min  90 Cases (16.9%)
  • >8min   112 Cases (21.1%)

• 88.6% Matched
  • 0-2    (86.3%)
  • 2-4    (88.5%)
  • 4-6    (87.2%)
  • 6-8    (89.7%)
  • >8     (93.1%)

ALS
Taipei City
Trauma Care System Pilot in 2002 – Taipei City

- Trauma Center Categorization
- Trauma Triage Protocol
- Education / Inservice
- System Evaluation
Major Trauma Criteria – Taipei City Example

- Unconscious (GCS < 14 or P / AVPU)
- Resp > 29 or < 10
- SBP < 90mmHg
- > 2 proximal long bone fracture
- Paralysis
- Amputation above ankle or wrist
- Penetrating wound to head, neck and torso
- Second degree burn > 15%
- Fall > 6 m
- High energy impact
- Patient comorbidity
Medical Direction Committee 1999

CITY GOVERNMENT

緊急醫療諮詢委員會
EMS Advisory Committee

醫療顧問委員會
Medical Directors' Committee

救護隊
EMS Squads

到院前救護
Prehospital Care

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Medical Direction Committee since 1999

Major responding hospitals in Taipei City
Main Tasks: Medical Direction Committee

- Set Standards / Protocols
- Education Programs
- Quality Control & Vigilance
- Implementation New Skills
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**注**
- 请根据实际情况填写内容。
- 表格中项目可根据需要调整。
事件編號：143001
建議：ALS

1. 已將患者扶至平躺處。
2. 不要將患者扶起。
3. 不要讓患者咳嗽。
4. 保持患者氣道的通暢並讓患者在輪椅的輪子之間做深呼吸。

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其他信息
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<tr>
<th>序号</th>
<th>内容</th>
<th>说明</th>
<th>数量</th>
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<td>3</td>
<td>内容3</td>
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</tbody>
</table>

- 图表显示了详细的项目信息和数量。
EMT Skill Competition
Medical Oversight / Director 2007

- System of medical oversight stipulated in EMS Act 2007
- Fire departments in jurisdictions required by law to identify medical director
- Medical Director Training by Taiwan Society of Emergency Medicine
- Pilot funding provided by Department of Health
- Currently, 15 / 23 jurisdictions have designated medical director
- Online consultation in Taipei City since 1999
Quality Assurance / Evaluation

Taipei City Government – NTUH ED

- OHCA and trauma registry
- Dispatch
- AED implementation
- Quality of CPR
- ALS effectiveness on OHCA
- Cost-effectiveness analysis on OHCA
- Trauma system implementation
- Clinical trial
- Development of quality Indicators for EMSS
2008 Healthy City Survey
• Therapeutic hypothermia: two hospital
• ECMO
• Clinical trial
• Web-based OHCA Registry
Problems
Early CPR: needs improvement

% bystander CPR

- 88% Self CPR
- 10% Dispatcher-guided
- 2% No CPR

Reason of no-CPR

- 33% No training
- 30% Think 119 will soon arrive
- 25% Unaware of arrest
- 10% Absence
- 2% Panic
AED in Taipei City EMS
Quality of CPR

- 264 cases, 23 premature termination, based on 241 analyses

Ko et al. Resuscitation 2005
Improve CPR delivery
Q-GPR™ Measurement and Feedback Tool: monitoring CPR quality in real time

Inadequate CPR
N=37 (73%)

On-scene ROSC
N=3 (8%)

<table>
<thead>
<tr>
<th>Inadequate CPR (N = 37)</th>
<th>Difference (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/37 (8%, 3–21%)</td>
<td>49% (19–68%)</td>
</tr>
<tr>
<td>5/37 (14%, 6–28%)</td>
<td>73% (45–85%)</td>
</tr>
<tr>
<td>3/37 (8%, 3–21%)</td>
<td>65% (37–82%)</td>
</tr>
<tr>
<td>3/37 (8%, 3–21%)</td>
<td>45% (19–68%)</td>
</tr>
</tbody>
</table>

CPR: cardiopulmonary resuscitation, ROSC: return of spontaneous


P-values:
- NS: not significant
- 0.04
- 0.001

Variables: differences of means or proportions and 95% confidence intervals.
Cause of Suboptimal CPR

Wang et al. Resuscitation 2007
Well... survival for VF is good, but we have so few of them! (13%)
During the process of phasing in ALS capability...

Sep. 2003 ~ Aug. 2004

All with BLS-D

+ ALS teams

Absence of signs of circulation and considered for Resuscitation
N = 1625

Etiology
Trauma n = 116

Etiology
Non-Trauma n = 1509

Resuscitation not attempted
N = 86

Resuscitation attempted
N = 1423

Any defibrillation attempt n = 150
Chest compressions n = 1423
Assisted ventilation n = 1423

First monitored rhythm
Nonshockable N = 1273
PEA n = 205
Asystole n = 1068

First monitored rhythm
Shockable N = 150

Outcome
Any ROSC n = 269
Survived event n = 194
Discharged alive n = 48

Outcome
Any ROSC n = 57
Survived event n = 48
Discharged alive n = 32
Adjusted Odds Ratios for Outcomes

1037 (73%) received BLS-D, and 386 (27%) received ALS.

<table>
<thead>
<tr>
<th>Type of services (ALS vs. BLS-D)</th>
<th>ROSC(%) OR 1.57 95%CI 1.18-2.08 p 0.002</th>
<th>Survival to ED/ICU Admission(%) OR 1.65 95%CI 1.21-2.25 p 0.002</th>
<th>Survival to Hospital Discharge(%) OR 1.41 95%CI 0.85-2.32 p 0.18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age group (66+ vs. 0-65)</td>
<td>1.25 0.94-1.67</td>
<td>0.12 1.10 0.80-1.51</td>
<td>0.57 1.32 0.78-2.23</td>
</tr>
<tr>
<td>Gender (Male vs. Female)</td>
<td>0.93 0.71-1.23</td>
<td>0.63 1.01 0.74-1.37</td>
<td>0.97 1.09 0.66-1.79</td>
</tr>
<tr>
<td>Witnessed by Bystander (Yes vs. No)</td>
<td>1.12 0.86-1.47</td>
<td>0.41 1.03 0.75-1.39</td>
<td>0.87 1.42 0.89-2.29</td>
</tr>
<tr>
<td>Bystander CPR (Yes vs. No)</td>
<td>1.72 0.97-3.04</td>
<td>0.06 1.85 1.01-3.44</td>
<td>0.04 2.26 1.03-3.44</td>
</tr>
<tr>
<td>Initial Monitored Rhythm (Shockable vs. Non-Shockable)</td>
<td>2.17 1.20-4.3</td>
<td>0.001 2.14 1.41-3.24</td>
<td>0.001 5.25 3.30-10.38</td>
</tr>
</tbody>
</table>

Ma et al. Resuscitation 2007
Adding video communication to dispatch instructions on the quality of rescue breathing in simulated cardiac arrests -- a randomized controlled study.

- **Yang CW, Wang HC, Chiang WC, Chang WT, Yen ZS, Chen SY, Ko PC, Ma MH, Chen SC, Chang SC, Lin FY.**

- **OBJECTIVE:** Both ventilations and compressions are important for victims of prolonged cardiopulmonary resuscitation (CPR) and asphyxial arrest. Dispatch assistance increases bystander CPR, but the quality of dispatcher-assisted CPR (DA-CPR), especially rescue breathing, remains unsatisfactory. This study was conducted to assess the impact of adding interactive video communication to dispatch instructions on the quality of rescue breathing in simulated cardiac arrests.

- **METHODS:** In this simulation-based study, adults without CPR training within 5 years were recruited between April and July 2007 and randomized to receive dispatch assistance with either voice instruction alone (voice group, n=53) or interactive voice and video instruction (video group, n=43) via a video cell phone. The quality of rescue breathing was evaluated by reviewing the videos and mannequin reports.

- **RESULTS:** Subjects in the video group were more likely to open the airway correctly (95.3% vs. 58.5%, P<0.01) and to lift the chin properly (95.3% vs. 62.3%, P<0.01), but had similar rates of head-tilt (95.3% vs. 84.9%, P=0.10). Volunteers in the video group had larger volume of ventilation (median volume 540 ml vs. 0 ml, P<0.01), greater possibility to sustain an open airway (88.4% vs. 60.4%, P<0.01) and a tendency towards better nose-pinch (97.7% vs. 86.8%, P=0.06). The video group spent longer time to open the airway (59 s vs. 56 s, P<0.05) and to give the first rescue breathing (139 s vs. 102 s, P<0.01).

- **CONCLUSION:** Adding video communication to dispatch instructions improved the quality of bystander rescue breathing, including higher proportion of airway opened, and larger volume of ventilation delivered, in simulated cardiac arrests.

Yang CW, Ma MHM, Resuscitation 2008, Crit Care Med 2009
The demand for prehospital advanced life support and the appropriateness of dispatch in Taipei

<table>
<thead>
<tr>
<th></th>
<th>ALS demand (n = 490)</th>
<th>BLS demand (n = 4943)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALS dispatch (n = 175)</td>
<td>65</td>
<td>117</td>
</tr>
<tr>
<td>BLS dispatch (n = 3258)</td>
<td>425</td>
<td>4822</td>
</tr>
</tbody>
</table>

Rate of ALS demand:
- Rate of ALS dispatch appropriateness: $\frac{490}{5433} = 9.02\%$
  - The number of people who should actually received ALS out of the number of people who actually received.
  - ALS = $\frac{(490 - 425)}{(5433 - 3258)} = \frac{65}{1175} = 5.52\%$
  - The number of people who should have received BLS out of the number of people who actually received.
  - BLS = $\frac{(490 - 65)}{(5433 - 3258)} = \frac{425}{1175} = 36.8\%$

Rate of ALS overtriage:
- The number of people who should have received ALS out of the number of people who actually received:
  - ALS = $\frac{(490 - 425)}{(5433 - 3258)} = \frac{65}{1175} = 5.52\%$

Rate of ALS undertriage:
- The number of people who should have received ALS out of the number of people who actually received:
  - BLS = $\frac{(490 - 65)}{(5433 - 3258)} = \frac{425}{1175} = 36.8\%$

Lu TC, Ma MHM, Resuscitation 2005  →  Computer Assisted......???
The infected rate was 1.3% (95% CI=0.4~3.6%),
or
0.1% (95% CI=0.03~0.4%) per transport.

Ko et al. Acad Emerg Med 2004
Challenges
IOM: EMS at the Cross Road

- Insufficient coordination
- Disparities in response times
- Uncertain quality of care
- Lack of readiness for disaster
- Divided professional identify
- Limited evidence-base
Momentum of Progress

Leadership

Providers

Partnership

Community
Our Visions

- **Providers**
  - Competent, motivated, and empowered

- **Service**
  - Evidence-based, state-of-the art, and cost-effective

- **Response**
  - Immediate and Smart

- **System**
  - Coordinated, continuous, optimized and accountable
Thank U
EMSS in Taipei Related Publications- NTUH


當我成為高級救護技術員時，
我衷心地保證，
要奉獻自己為救護工作服務。

我將遵從倫理與法律的規範
為危急傷病患的福祉奮鬥。

維護病患的安全是我最高的原則，
保障病患的隱私是我當負的責任。

即使環境險惡，我仍要全力以赴。
讓所有的生老病苦，在我面前都能得到安撫。

我會持續精進自己的能力與判斷，
也會分享知識給任何需要的同僚，
為建立起高級救護技術員的光榮傳統，
我會盡最大的努力。

請上蒼賜予我智慧與勇氣，
讓每次的任務都能化險為夷。

我鄭重地，自主地以我的人格，作以上的宣誓。