Pre-hospital Emergency Care in Singapore

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COI declaration

• Dr Ng Wei Ming - No conflicts of interest to declare

• Dr Marcus Ong is Scientific Advisor to Global Healthcare SG and TIIM SG

It Takes a System to Save a Life
Modified Frame of Survival - Improving OHCA Outcomes in Developing EMS Systems

Singapore: Then and Now

Singapore: Then and Now
Emergency Medical Service (EMS) System

• Run by the Singapore Civil Defense Force
• Currently operating 46 ambulances in 14 stations and 10 satellite stations
• Single Tier System
• Able to provide BCLS and defibrillation using Automated External Defibrillators (AEDs)

Early basic and advanced care

• Oxygen
• Airway adjuncts
• Immobilise fractures and spinal injuries
• IV fluids
• Tamponade bleeding
• Laryngeal mask airway
• Aspirin (Oral)
• Salbutamol
• Dextrose
• GTN
• Adrenaline (intravenous)
• Oxytocin
• Diazepam for seizures
• Enthanox/Penthrox/Tramadol
• Intraosseous

Factoring for aging population - 10% elderly (Age >65 years) accounted for 35% of usage in 2011
OHCA overall Incidence

- Elderly (>65) with OHCA increasing, relative those less than <65
- Crude incidence rates are high due to aging population
- Age-standardised population incidences are relatively lower

Motorcycle First Responders in EMS – The Singapore Experience

Dr Ng Wei Ming

Motorcycle Ambulances

- Used since World War by British, French and Americans mainly for transport and mobility
Speed + Mobility + Manoeuvrability

Evolution of Motorcycle Use Today

- More commonly in law enforcement
- Used more for rapid access
- Complement transport capable appliances
- More common in 'complex terrain' (Urban/Rural)

Rapid Response

It takes an average 6 minutes for a motorcycle rapid response paramedic to reach an emergency situation in the CBD, compared to 12 minutes for ambulances.
Use in Special Restriction Areas/Events

"Because of the increasing fears of terrorists, bollards have been put up particularly in the pedestrian areas. There is vehicle access but they’re gated so ambulance officers have to either get out and open the keys or wait for someone to open the gate," he said.

Use for Transport

- Low cost to run ($1-10k to run vs $100k-1mil annually)
- Easy to operate and maintain
- Maneuverable
- Access terrain not suitable for heavy vehicles
Today, the use of motorcycle first responders is widespread worldwide

- Hong Kong
- United Kingdom
- Australia
- Japan
- Brazil
- United States of America
- Singapore

(Mencl, 2012)
Singapore
Area 719 km²
Urban / Suburban
Population 5.6 mil
Multi-racial/cultural/religion

3rd highest population density in the world

High Road Density
- 2nd highest country in the world for vehicles per km of road (after Monaco)
- Traffic congestion partially managed through
  - electronic road pricing
  - Car purchase permits (COE)
  - Greenwave technology
Fast response medic (FRM)

- First introduced in 1992 by EAS due to the long ambulance response times caused by traffic congestion.
- Responded only to trauma cases from road accidents.
- Provided initial treatment before ambulance arrival.
- Trained in first aid, CPR and AED.
- Equipped with trauma bag, oxygen bag, AED, and basic rescue equipment.

(Lateef & Anantharaman, 2000)

Fast response paramedics (FRPs)

- Replaced the FRMs.
- Consisted of fully trained paramedics with higher levels of medical competency which allowed them to attend to both medical and trauma cases.
- Further trained in defensive riding.
- FRPs operated alone.
- Equipped with basic life support equipment including trauma bag, AED, IV fluids and bag valve mask device.
- Responded to road accidents, cardiac arrests, breathing difficulties and chest pains
- Reduced response time by almost 5 minutes.

(Ong, Chan & Anantharaman, 2003)
### Motorcycle EMS in Singapore

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
</table>
| 1992 | Fast Response Medic  
• 2 first aiders riding pillion |
| 1997 | Solo Fast Response Paramedic replaces FRM |
| 1998 | Separate firebiker scheme started |
| 2012 | Firebikers take on role of first aid  
• FRPs absorbed back to ambulance  
• 2017 – Firebikers upgraded fully to EMT-Basic  
• Time sensitive cases |

### Firebiker First Responders (2012-current)

- 3 wheeled bike
- Attends to adult cardiac arrest and fires
- Not activated during heavy rain
- Average response time of firebiker is 6:39min while ambulance is 8:55min, saving 2 minutes per call.

### Current Firebikers Scheme

- The new bikes can be parked like a car without needing a bike stand. Further cut down on response time.
- Deployed at both fire stations and fire posts.
- KPI aims to reach patient within 8 minutes.
- Attend to fire/rescue and P1+ cases under the EMS tiered response plan.
- Two bikes from two different bases are dispatched for fire/rescue cases.
- One bike dispatched for cardiac arrest incidents.

(Kuah, Fan, & Ng, 2016; Ng, 2016)

<table>
<thead>
<tr>
<th>Year</th>
<th>Calls</th>
<th>EMS calls</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>4724</td>
<td>155,781</td>
</tr>
</tbody>
</table>

2012 Introduction of Fire Bikes Responder with AEDs

Fire bike manned by FRS-EMTs activated to selected time sensitive cases, in addition to ambulance response

From April 2017...

Enhancing Capabilities

New and upgraded vehicles
- The Singapore City Police (SFP)
- The Singapore General Hospital (SGH)
- The Singapore General Hospital (SGH)
- The Singapore General Hospital (SGH)

Three vehicles: Fire Bikes
- New and upgraded vehicles
- Enhanced capabilities
List of Equipments

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Aid Bag</td>
<td>1</td>
</tr>
<tr>
<td>Eye Drops</td>
<td>1</td>
</tr>
<tr>
<td>Surgical Scissor</td>
<td>1</td>
</tr>
<tr>
<td>Bleeding Control</td>
<td>1</td>
</tr>
<tr>
<td>Chest Seal</td>
<td>1</td>
</tr>
<tr>
<td>Dressing</td>
<td>1</td>
</tr>
</tbody>
</table>

Road Safety and risk mitigation in SCDF

- Risk for frequency of injuries, types and extent of injuries are greater than ambulance crews
- Not deployed during inclement weather
- Defensive riding courses
- Riding helmets
- Fire jackets
- 3 Wheeled Piaggio bikes for increased stability
- 500cc for greater control when carrying larger payloads of Compressed Air Foam and medical equipment
### Workload Challenges for Firebikers

- Dual-role fire bikes workforce receive ~150,000 responses a year and are involved in regular fire and rescue calls (~5,000)
- Working in 24hr fire shifts vs 12hrs for ambulance shifts
- Also additional burden of dual training and certifications
- Increased complexity of working as a solo first responder

### Challenges of Culture Shift

- Shifting focus from fire to EMS activities
- Significant more task complexity and frequency
- Need to train in soft skills for EMS
- Learning to do clinical documentation

### Conclusion

- EMS motorcycle first responders can play a role where
  - Condition is time sensitive
  - Access/terrain is difficult
  - There are untapped potential first responders (fire or even law enforcement)

- Bearing in mind
  - Increased risk in operations
  - Limits in what they can do as a single provider
  - Need for customised programs for training, certification and CMEs
Strategies to Improve Gaps

Patient collapse

- Delayed recognition of symptoms
- Poor bystander response

Emergency medical dispatch through 995 calls

- Increasing call volumes (6.7%/ year on average)
- Need for medical prioritisation
- Need for pre-arrival instructions

Ambulance with EMS personnel

- Need for sufficient ambulances (1/80,000)
- Need for efficient ambulance deployment

A&E at the nearest RH

- Need for quality control and assurance

Lack of training and continuing education for EMS personnel including dispatcher

Increase Public Education and Training

- Delayed recognition of symptoms
- Poor bystander response

Pyramid of First Responder Preparedness

- CPR/AED Instructor
- CPR/AED Certified
  Anyone who attends and passes an NRC Certified CPR/AED course
- DARE Trained
  Anyone aged 11 and above who attend DARE training sessions.

DARE Aware: Everyone becomes aware of what we teach in DARE through social media, traditional media, or by word of mouth.
Dispatcher-Assisted First Responder Programme (DARE)
AED Installation by SCDF

- SCDF installing AEDs near lifts in all public Apartments
- National AED registry and MyResponder

myResponder app

- The app is the public interface of the R-AEDi project
- R-AEDi is a joint SCDF-SHF initiative to:
  - register and geo locate all public AEDs
  - registry of volunteer 1st responders
- 48970 registered (July 2017)

Smart Technology
The Rise of the Super-Responders

超人

Manage Calls and Dispatch
Manage EMS
Transition and Return
Emergency Call Dispatch
Monitoring
Conveyance
Locate/Treat/Deliver
Handover to ED
Return to Service
Operations Centre
Mobile Devices
Smart Ambulance Device
Participating EDs (SGH, KTPH and TTSH)
995 call/situational data
Electronic Case Record Incident Details on IBCR
Clinical Data Capture
My Responder<br>Heartsave forms IBCR Dispatch Tape Review
HDG (MOHH)
MHA Firewall
Data Warehouse
Extract, Transform, Load
Hospital Firewall
PEC IT Blueprint and Analytics
Potential Area of Analytics
- Research on OHCA, Trauma, Stroke and STEMI
OMNI

Project John Doe

- Local and Remote Fingerprint capturing and screening/matching capabilities
- Remote Facial screening/matching capabilities
- Remote Iris scab screening/matching capabilities
New Concept of Operations

<table>
<thead>
<tr>
<th>EAS lvl 4</th>
<th>PAO lvl 3</th>
<th>FRS-EMT</th>
<th>FB-EMT</th>
<th>1777</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1+ Primary</td>
<td>Assist lvl 4</td>
<td>Bridging response</td>
<td>Bridging response</td>
<td></td>
</tr>
<tr>
<td>P1 Primary</td>
<td>Secondary</td>
<td>Fire/Trauma</td>
<td>Fire/Trauma</td>
<td></td>
</tr>
<tr>
<td>P2 Secondary</td>
<td>Primary</td>
<td>Fire/Trauma</td>
<td>Fire/Trauma</td>
<td></td>
</tr>
<tr>
<td>P3</td>
<td>Assess for tpt</td>
<td>Assess for tpt</td>
<td>Transport</td>
<td></td>
</tr>
<tr>
<td>P4</td>
<td>Assess for tpt</td>
<td>Assess for tpt</td>
<td>Transport</td>
<td></td>
</tr>
</tbody>
</table>

- Lvl 4 lvl 3 ambulances will respond to time sensitive P1s with FB/FRS EMT.
- Lvl 4 will respond to P1
- Lvl 3 will respond to P2
- EMTs will assess P3/P4 and provide first aid if its unclear whether transport is needed
- 1777 used to transport stable P3/P4
Survival Rates: Overall, Utstein, <65 and >65

- Witnessed cardiac arrest survival rates have doubled from 11.6 to 21.3%
- Overall survival rates have gone up from 3.5 to 5.3%
- Younger patients (<65) are 2.6 times more likely to survive than older patients (>65)

Timeline of Interventions

- Total survivors increased from 48 to 125.
- Bystander CPR rates increase from 22% to 54%
- AED use 1.8% to 4.1%
- EMS response time gradually increasing 8.3mins → 9.3mins