

# European Emergency Data Project

## EMS Data-based Health Surveillance System

Grant Agreement No. SPC.2002299



# APPENDIX

**compiled and edited by**

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on behalf of the EED project group

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**Appendix 3:**  
**"Patient Journey" by system**

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System	Response (best local solution)	On Scene	Disposal and Referral
<b>Bonn, Germany</b> <b>Chest pain &amp; Cardiac arrest</b>	<p><b>BEST SOLUTION (ALS, BLS)</b></p> <ul style="list-style-type: none"> <li>ALS + BLS</li> </ul> <p><b>RESPONSE GENERATOR</b></p> <p><b>ALTERNATIVES</b></p> <ul style="list-style-type: none"> <li>first BLS, then ALS</li> </ul> <p><b>WORST SOLUTION</b></p> <ul style="list-style-type: none"> <li>doing nothing</li> </ul> <p><b>ESSENTIAL CARE</b></p> <ul style="list-style-type: none"> <li>No advices to the caller by dispatch center</li> </ul>	<p><b>ESSENTIAL INTERVENTION AND SUPPORT:</b></p> <ul style="list-style-type: none"> <li>Medical history, clinical examination</li> </ul> <p><b>OPTIONS TO EXIT:</b></p> <ol style="list-style-type: none"> <li>TREAT AND LEAVE</li> <li>TREAT AND REFER</li> <li>CONFIRM DEATH</li> </ol> <ul style="list-style-type: none"> <li>Treatment at home, referral to general practitioner and confirmation of death by emergency physician possible</li> </ul>	<p><b>DECISION</b></p> <ol style="list-style-type: none"> <li>TERTIARY / SUPER SPECIALIS</li> <li>SECONDARY</li> <li>LOCAL</li> </ol> <ul style="list-style-type: none"> <li>Decision by emergency physician, all kinds of clinical treatment (ICU, rt-PA, PTCA) 24 h a day possible</li> </ul> <p><b>OPTIONS TO EXIT:</b></p> <p><b>ALTERNATIVES: Refer to primary care</b></p> <ul style="list-style-type: none"> <li>GP</li> </ul>
<b>Catabria, Spain</b> <b>Cardiac arrest</b>	<p><b>BEST SOLUTION</b></p> <ul style="list-style-type: none"> <li>Computer recommends a specify unit for the address and the responses level.</li> </ul> <p><b>RESPONSE GENERATOR</b></p> <ul style="list-style-type: none"> <li>Dispatcher sends the selected unit</li> </ul> <p><b>ALTERNATIVES</b></p> <ul style="list-style-type: none"> <li>Mutual aid if no units are available.</li> </ul> <p><b>WORST SOLUTION</b></p> <ul style="list-style-type: none"> <li>BLS</li> </ul> <p><b>ESSENTIAL CARE</b></p> <ul style="list-style-type: none"> <li>On line instructions are given on a no formal procedure by the medical director</li> </ul>	<p><b>ESSENTIAL INTERVENTION AND SUPPORT:</b></p> <p>CPR, application of heart monitor/defibrillator, defibrillation as appropriate, constant ECG monitoring, advanced airway manoeuvres, IV access and appropriate medications administered, monitoring of vital signs and oxygen saturation status, capnography, post arrest support, transport if indicated</p> <ol style="list-style-type: none"> <li><b>TREAT AND LEAVE:</b> <ul style="list-style-type: none"> <li>(ALS treatment with no response, EMS ceased resuscitation, proper authorities notified.)</li> </ul> </li> <li><b>TREAT AND REFER:</b> <ul style="list-style-type: none"> <li>(ALS treatment and transport to hospital)</li> </ul> </li> <li><b>CONFIRM DEATH:</b> <ul style="list-style-type: none"> <li>(DOA = Dead on Arrival, no resuscitation attempted)</li> </ul> </li> </ol>	<p><b>DECISION :</b></p> <ul style="list-style-type: none"> <li>Transport to hospital with ICU</li> <li>If no transport: Notify proper authorities</li> </ul>
<b>Catabria, Spain</b> <b>Chest pain</b>	<p><b>BEST SOLUTION</b></p> <ul style="list-style-type: none"> <li>Computer recommends a specify unit for the address and the responses level.</li> </ul> <p><b>RESPONSE GENERATOR</b></p> <ul style="list-style-type: none"> <li>Dispatcher sends the selected unit</li> </ul> <p><b>ALTERNATIVES</b></p> <ul style="list-style-type: none"> <li>Mutual aid if no units are available.</li> </ul> <p><b>WORST SOLUTION</b></p> <ul style="list-style-type: none"> <li>BLS</li> </ul> <p><b>ESSENTIAL CARE</b></p> <p>On line instructions are given on a no formal procedure by the medical director</p>	<p><b>ESSENTIAL INTERVENTION AND SUPPORT:</b></p> <p>Application of heart monitor/defibrillator, defibrillation as appropriate, constant ECG monitoring, 12 leads ECG, Oxygen, IV access and appropriate medications administered, monitoring of vital signs and oxygen saturation status, transport if indicated</p> <p><b>OPTIONS TO EXIT:</b></p> <ol style="list-style-type: none"> <li>TREAT AND LEAVE: <ul style="list-style-type: none"> <li>(ALS treatment, GP contact)</li> </ul> </li> <li>TREAT AND REFER: <ul style="list-style-type: none"> <li>(ALS treatment and transport to hospital)</li> </ul> </li> </ol>	<p><b>DECISION :</b></p> <ul style="list-style-type: none"> <li>Transport to hospital with (rt-PA) 24 h a day possible</li> <li>If not transport: Notify GP</li> </ul> <p><b>Options to exit:</b></p> <p><b>ALTERNATIVES: None other at present</b></p>

System	Response (best local solution)	On Scene	Disposal and Referral
<b>Copenhagen, Denmark</b>  <b>Cardiac arrest</b>	<p><b>BEST SOLUTION:</b></p> <ul style="list-style-type: none"> <li>Dispatcher talks to caller, response level decision, Closest ALS-ambulance chosen (most of the country GPS-information)</li> </ul> <p><b>RESPONSE GENERATOR:</b></p> <ul style="list-style-type: none"> <li>Dispatcher sends closest ALS ambulance and MECU (EP)</li> </ul> <p><b>ALTERNATIVES:</b></p> <ul style="list-style-type: none"> <li>Mutual aid if no units are available</li> </ul> <p><b>WORST SOLUTION:</b></p> <ul style="list-style-type: none"> <li>Change in priority Delay in response</li> </ul> <p>ESSENTIAL CARE</p>	<p><b>ESSENTIAL INTERVENTION AND SUPPORT:</b> Advanced CPR, monitoring, defibrillation if appropriate, constant ECG monitoring, advanced airway management, IV access and appropriate medications administered, monitoring of vital signs and oxygen saturation, end-tidal CO<sub>2</sub>, post arrest support, transport if indicated</p> <p><b>OPTIONS TO EXIT:</b></p> <ol style="list-style-type: none"> <li><b>TREAT AND LEAVE :</b> <ul style="list-style-type: none"> <li>Definitive Care provided at scene</li> </ul> </li> <li><b>TREAT AND REFER:</b> <ul style="list-style-type: none"> <li>MECU transfers to hospital – alerting hospital</li> </ul> </li> <li><b>NO CARE NEEDED:</b> <ul style="list-style-type: none"> <li>Physician: Declaration of dead - DNR</li> </ul> </li> </ol>	<p><b>DECISION</b></p> <ul style="list-style-type: none"> <li>Transport to hospital while continuously monitoring and treatment</li> <li>If not resuscitated:</li> <li>Information</li> <li>Documentation</li> <li>Information of proper authorities</li> <li>Transfer to hospital</li> </ul> <p><b>OPTIONS TO EXIT:</b></p> <p>ALTERNATIVES:None other at present</p>
<b>Copenhagen, Denmark</b>  <b>Chest pain</b>	<p><b>BEST SOLUTION:</b></p> <ul style="list-style-type: none"> <li>Dispatcher talks to caller, response level decision, Closest ALS-ambulance chosen (most of the country GPS-information)</li> </ul> <p><b>RESPONSE GENERATOR:</b></p> <ul style="list-style-type: none"> <li>Dispatcher sends closest ALS ambulance and MECU (EP)</li> </ul> <p><b>ALTERNATIVES:</b></p> <ul style="list-style-type: none"> <li>Mutual aid if no units are available</li> </ul> <p><b>WORST SOLUTION:</b></p> <ul style="list-style-type: none"> <li>Change in priority Delay in response</li> </ul> <p>ESSENTIAL CARE</p>	<p><b>ESSENTIAL INTERVENTION AND SUPPORT:</b> Assesment, monitoring, 12 lead ECG monitoring, oxygen, IV access and appropriate medications morphine, aspirin, monitoring of vital signs, transported when stable if possible</p> <p><b>OPTIONS TO EXIT:</b></p> <ol style="list-style-type: none"> <li><b>TREAT AND LEAVE :</b> <ul style="list-style-type: none"> <li>If appropriate or diagnose wrong/ patient refuses</li> </ul> </li> <li><b>TREAT AND REFER:</b> <ul style="list-style-type: none"> <li>MECU transfers to hospital – alerting hospital</li> </ul> </li> <li><b>NO CARE NEEDED:</b> <ul style="list-style-type: none"> <li>No treatment</li> </ul> </li> </ol>	<p><b>DECISION :</b></p> <ul style="list-style-type: none"> <li>Transport to hospital with continuously monitoring and treatment as indicated</li> <li>If not transported:</li> <li>Information of risks / informed consent</li> <li>Documentation</li> <li>Urge to call again</li> </ul> <p><b>OPTIONS TO EXIT:</b></p> <p>ALTERNATIVES:None other at present</p>
<b>Garches, Paris</b>  <b>Cardiac arrest</b>	<p><b>BEST SOLUTION:</b></p> <ul style="list-style-type: none"> <li>ALS ambulance is sent on scene + BLS ambulance</li> <li>BLS to check</li> <li>BLS to check</li> </ul> <p><b>RESPONSE GENERATOR</b></p> <ul style="list-style-type: none"> <li>Dispatching Dr</li> </ul> <p><b>WORST SOLUTION = BEST SOLUTION:</b></p> <ul style="list-style-type: none"> <li>call for help from other EMS from other province</li> </ul> <p>ESSENTIAL CARE</p>	<p><b>ESSENTIAL INTERVENTION AND SUPPORT</b></p> <p>Options to exit:</p> <ol style="list-style-type: none"> <li><b>TREAT AND LEAVE</b></li> <li><b>TREAT AND REFER</b></li> <li><b>CONFIRM DEATH</b></li> </ol>	<p><b>DECISION:</b></p> <ul style="list-style-type: none"> <li>taken by the dispatching doctor according to diagnosis made on scene by MD</li> </ul>

System	Response (best local solution)	On Scene	Disposal and Referral
<b>Garches, France</b> <b>Chest pain</b>	<p><b>BEST SOLUTION:</b></p> <ul style="list-style-type: none"> <li>ALS ambulance is sent on scene (+/- BLS ambulance)</li> <li>GP on scene or BLS with ECG transmission</li> <li>BLS to check</li> </ul> <p><b>RESPONSE GENERATOR</b></p> <ul style="list-style-type: none"> <li>Dispatching Dr</li> </ul> <p><b>WORST SOLUTION = BEST SOLUTION:</b></p> <ul style="list-style-type: none"> <li>call for help from other EMS from other province</li> </ul> <p><b>ESSENTIAL CARE</b></p>	<p><b>ESSENTIAL INTERVENTION AND SUPPORT</b></p> <p>Options to exit:</p> <ol style="list-style-type: none"> <li>TREAT AND LEAVE</li> <li>TREAT AND REFER</li> <li>CONFIRM DEATH</li> </ol>	<p><b>DECISION:</b></p> <ul style="list-style-type: none"> <li>taken by the dispatching doctor according to diagnosis made on scene by MD (see ACS level strategy)</li> <li>If patient denies transportation: waiver release signed &amp; kept with records of witnesses that will testify</li> </ul>
<b>Gothenburg, Sweden</b> <b>Chest pain &amp; Cardiac arrest</b>	<p><b>BEST SOLUTION (ALS, BLS)</b></p> <ul style="list-style-type: none"> <li>ALS + BLS</li> </ul> <p><b>RESPONSE GENERATOR</b></p> <p><b>ALTERNATIVES</b></p> <ul style="list-style-type: none"> <li>first BLS, then ALS</li> </ul> <p><b>WORST SOLUTION</b></p> <ul style="list-style-type: none"> <li>doing nothing</li> </ul> <p><b>ESSENTIAL CARE</b></p> <ul style="list-style-type: none"> <li>Advice to the caller (eg. telephone CPR) by dispatch center</li> </ul>	<p><b>ESSENTIAL INTERVENTION AND SUPPORT:</b></p> <ul style="list-style-type: none"> <li>Medical history, clinical examination</li> </ul> <p><b>OPTIONS TO EXIT:</b></p> <ol style="list-style-type: none"> <li>TREAT AND LEAVE</li> <li>TREAT AND REFER <ul style="list-style-type: none"> <li>Treat and refer to hospital</li> </ul> </li> <li>CONFIRM DEATH <ul style="list-style-type: none"> <li>Confirm death usually not allowed</li> </ul> </li> </ol>	<p><b>DECISION :</b></p> <ol style="list-style-type: none"> <li>TERTIARY / SUPER SPECIALIS</li> <li>SECONDARY</li> <li>LOCAL</li> </ol> <p>Transport to hospital</p> <ul style="list-style-type: none"> <li>emergency room</li> <li>coronary unit</li> <li>PTCA</li> </ul> <p>No transport</p> <p><b>OPTIONS TO EXIT:</b> <b>ALTERNATIVES: REFER TO PRIMARY CARE</b></p>
<b>Helsinki, Finland</b> <b>Cardiac arrest</b>	<p><b>BEST SOLUTION:</b></p> <p>FRU if closest ALS = emergency physician</p> <p><b>RESPONSE GENERATOR</b></p> <p>First unit alerted as soon as address verified and high risk anticipated</p> <p><b>WORST SOLUTION:</b></p> <ul style="list-style-type: none"> <li>BLS only</li> </ul> <p><b>ESSENTIAL CARE:</b></p> <ul style="list-style-type: none"> <li>telephone CPR</li> </ul>	<p><b>ESSENTIAL INTERVENTION AND SUPPORT</b></p> <p><b>OPTIONS TO EXIT:</b></p> <ol style="list-style-type: none"> <li>TREAT AND CONFIRM DEATH</li> <li>CONFIRM DEATH</li> </ol>	<p><b>DECISION:</b></p> <p>by physician on scene or EMS consulting M.D.; OR EMS crew if secondary signs of death</p> <ol style="list-style-type: none"> <li>TERTIARY / SUPER SPECIALIS</li> <li>SECONDARY</li> <li>NO TRANSPORT <ul style="list-style-type: none"> <li>police arranges transport</li> </ul> </li> </ol>
<b>Helsinki, Finland</b> <b>Chest pain</b>	<p><b>BEST SOLUTION:</b></p> <p>FRU if closest ALS = emergency physician</p> <p><b>RESPONSE GENERATOR</b></p> <p>First unit alerted as soon as address verified and high risk anticipated</p> <p><b>WORST SOLUTION:</b></p> <ul style="list-style-type: none"> <li>BLS only</li> </ul> <p><b>ESSENTIAL CARE:</b></p> <ul style="list-style-type: none"> <li>dispatcher advice</li> </ul>	<p><b>ESSENTIAL INTERVENTION AND SUPPORT</b></p> <p><b>OPTIONS TO EXIT:</b></p> <ol style="list-style-type: none"> <li>TREAT AND LEAVE</li> <li>TREAT AND REFER</li> <li>CONFIRM DEATH</li> </ol>	<p><b>DECISION :</b></p> <p>by physician on scene or EMS consulting M.D. according to regions' SOP or clinical condition</p> <ol style="list-style-type: none"> <li>TERTIARY / SUPER SPECIALIS</li> <li>SECONDARY</li> <li>LOCAL</li> <li>NO TRANSPORT <ul style="list-style-type: none"> <li>a) not indicated b) refuses</li> </ul> </li> </ol> <p><b>OPTIONS TO EXIT:</b></p> <p><b>ALTERNATIVES: refer to primary care</b></p>

System	Response (best local solution)	On Scene	Disposal and Referral
<b>INEM, Portugal</b> <b>Chest pain &amp; Cardiac arrest</b>	<p><b>BEST – MEDICAL VEHICLE:</b></p> <ul style="list-style-type: none"> <li>• Doctor and nurse</li> <li>• ALS</li> <li>• Or helicopter with a crew of doctor and nurse</li> </ul> <p><b>ALTERNATIVE:</b></p> <ul style="list-style-type: none"> <li>• ambulance</li> <li>• BLS</li> <li>• 1 Ambulance technician (50%)</li> <li>• 2 helpers (socorristas)</li> </ul>	<p><b>ESSENCIAL INTERVENTION AND SUPPORT</b></p> <p><b>MEDICAL VEHICLES:</b></p> <ul style="list-style-type: none"> <li>• ALS</li> <li>• Defibrillation</li> <li>• Ventilation</li> </ul> <p><b>TREAT AND LEAVE/ TREAT AND REFER/CONFIRM DEATH</b></p> <ul style="list-style-type: none"> <li>• They do everything...</li> </ul> <p>Rendez-vous with Ambulance Authomatic defibrillation not yet available waiting for meeting with ERC (CPR in Portugal)</p>	<p>Hospital:</p> <ul style="list-style-type: none"> <li>• Emmergency department</li> <li>• ICU</li> </ul>
<b>Kufstein, Austria</b> <b>Cardiac arrest</b>	<p><b>BEST SOLUTION:</b> Calltaker talks to caller as „First first Responder, Dispatch Life Support and CAD System transfers case inforamtion to the Dispatcher</p> <p><b>RESPONSE GENERATOR</b></p> <ul style="list-style-type: none"> <li>• Dispatcher sends closest ALS or HEMS and at every case a BLS ambulance.</li> </ul> <p><b>ALTERNATIVES:</b> General Practitioner no units are available, or long response time.</p> <p><b>WORST SOLUTION:</b> Blind response—no caller information, no first response.</p>	<p><b>ESSENTIAL INTERVENTION AND SUPPORT:</b> ECG monitoring, oxygen, IV access and appropriate medications administered (i.e., aspirin, morphine, dopamine, epinephrine, antiarrhythmics, xylocaine, metalyse etc.), monitoring of vital signs and oxygen saturation status, ventilatory support if needed, transport if indicated.</p> <p><b>OPTIONS TO EXIT:</b></p> <ol style="list-style-type: none"> <li>1. TREAT &amp; LEAVE or (ALS treatment—if allowed by patient, if patient refuses PATIENT REFUSES TRANSPORT to hospital, EMS explains risks, EMS leaves after obtaining signature of refusal.) <ul style="list-style-type: none"> <li>• Refusing 0%</li> </ul> </li> <li>2. TREAT &amp; TRANSPORT <ul style="list-style-type: none"> <li>• (ALS treatment and transport to appropriate hospital)</li> </ul> </li> <li>3. NO CARE NEEDED <ul style="list-style-type: none"> <li>• (poor information or communication, no care needed)</li> </ul> </li> </ol>	<p><b>DECISION :</b></p> <ul style="list-style-type: none"> <li>• Transport to hospital with ALS treatment Patient with pulse</li> <li>• If no transport: <ol style="list-style-type: none"> <li>a. Turn attention to family &amp; survivors, acknowledge and facilitate the grief process</li> <li>b. Notify proper authorities</li> <li>c. (transport arranged to Medical Examiner).</li> </ol> </li> </ul> <p><b>OPTIONS TO EXIT:</b></p> <p>ALTERNATIVES:None other at present</p>
<b>Kufstein, Austria</b> <b>Chest pain</b>		<p><b>ESSENTIAL INTERVENTION AND SUPPORT:</b> CPR, application of heart monitor/defibrillator, defibrillation as appropriate, constant ECG monitoring, advanced airway maneuvers, IV access and appropriate medications administered, monitoring of vital signs and oxygen saturation status, post arrest support, transport if indicated</p> <p><b>OPTIONS TO EXIT:</b></p> <ol style="list-style-type: none"> <li>1. TREAT AND LEAVE <ul style="list-style-type: none"> <li>• (ALS treatment with no response, EMS ceased resuscitation, proper authorities notified.)</li> </ul> </li> <li>2. TREAT AND REFER <ul style="list-style-type: none"> <li>• (ALS treatment and transport to hospital)</li> </ul> </li> <li>3. CONFIRM DEATH (DOA = Dead on Arrival, no resuscitation attempted)</li> </ol>	<p><b>DECISION:</b> by Emergency Physician</p> <ul style="list-style-type: none"> <li>• Transport to hospital with ALS treatment (ICU) PTCA 24 h a day possible only available at the University Hospital of Innsbruck</li> <li>• HEMS Transport to Innsbruck if PTCA needed (max. Disdance 150 km)</li> </ul> <p><b>OPTIONS TO EXIT:</b></p> <p>ALTERNATIVES: Refer to primary Care (General Practitioner)</p>

System	Response (best local solution)	On Scene	Disposal and Referral
<p><b>Leuven, Belgium</b></p> <p><b>Cardiac arrest</b></p>	<p><b>BEST SOLUTION:</b>The computer recommends (out of all the MUG teams) the 3 nearest (in time) available MUG teams and ambulances</p> <ul style="list-style-type: none"> <li>The dispatcher chooses and alerts orally the chosen MUG + ambulance team</li> </ul> <p><b>ALTERNATIVES:</b> far away teams are called in ; eventually an hospital is contacted to generate a back-up team (third or fourth)</p> <p><b>WORST SOLUTION:</b> only ambulance dispatched</p> <p><b>ESSENTIAL CARE:</b> no advices about medical problem solving. In case of problems or suppl. Info (evolving risks/route/location): guiding by radiocommunication.</p>	<p>Team with highest expertise manages the incident</p> <p>1.Ambulance</p> <ul style="list-style-type: none"> <li>BLS according to ERC protocol</li> </ul> <p>2.MIVA</p> <ul style="list-style-type: none"> <li>BLS + medication according to standing orders</li> <li>3.MUG BLS + ALS according to ERC protocol</li> </ul> <p><b>OPTIONS TO UPGRADE RESPONSE:</b> MUG, 2nd MUG, expertise, ...</p> <p><b>OPTIONS TO EXIT</b></p> <p>1.TREAT AND LEAVE if ALS is unsuccessful (confirmation/certification of death by medical doctor)</p> <p>2.TREAT AND REFER: MUG team accompanies patient to definitive care facility (ref. centre)</p> <p>3.DOA by medical doctor only (confirmation/certification).</p>	<p>MUG + ambulance team transports patient to a definitive care facility (might not be the closest hospital). <b>IF PATIENT IS DEAD:</b></p> <p>1.MUG team:</p> <ul style="list-style-type: none"> <li>fulfills the administrative procedures initiates psychosocial support of family and surroundings</li> </ul> <p>2.In special circumstances transport to hospital for:</p> <ul style="list-style-type: none"> <li>Support of family and surroundings</li> <li>Scientific reasons (obduction)</li> </ul> <p><b>ALTERNATIVES:</b> none</p>
<p><b>Leuven, Belgium</b></p> <p><b>Chest pain</b></p>	<p><b>BEST SOLUTION:</b></p> <ol style="list-style-type: none"> <li>The dispatcher chooses depending on result sorting and on etiology/severity of chest pain: <ul style="list-style-type: none"> <li>MUG + MIVA/ambulance</li> <li>MIVA/ambulance</li> </ul> </li> <li>The computer recommends (out of all the MUG teams) the 3 nearest (in time) available MUG teams and ambulances</li> <li>The dispatcher chooses and alerts orally the chosen MUG + ambulance team</li> </ol> <p><b>ALTERNATIVES:</b> none</p> <p><b>WORST SOLUTION:</b> far away teams – EMSS based on volunteers</p> <p><b>ESSENTIAL CARE:</b> no advices about medical problem solving In case of problems or suppl. info (evolving risks / route / location): guiding by radiocommunication</p>	<p>1.Ambulance:</p> <ul style="list-style-type: none"> <li>oxygen therapy</li> <li>handbook for ambulancemen</li> </ul> <p>2.MIVA</p> <ul style="list-style-type: none"> <li>standing orders</li> <li>supportive medication and actions</li> </ul> <p>3.MUG</p> <ul style="list-style-type: none"> <li>treatment</li> <li>diagnosis and definitive start</li> </ul> <p><b>OPTIONS TO UPGRADE RESPONSE:</b> MUG, 2nd MUG, expertise</p> <p><b>OPTIONS TO EXIT</b></p> <p>1.MUG: treat and refer to family doctor/transport to hospital</p> <p>2.Others: no options, always bring to hospital</p>	<p>1.Ambulance : transport to the nearest hospital or to the hospital designated by family doctor</p> <p>2.MIVA : transport to the nearest hospital or to the hospital designated by family doctor or patient</p> <p>3.MUG : transport to appropriate care facility (might not be the closest hospital)</p> <p><b>ALTERNATIVES:</b> none</p>

System	Response (best local solution)	On Scene	Disposal and Referral
<p><b>Richmond, VA, United States of America</b></p> <p><b>Chest pain</b></p>	<p><b>BEST SOLUTION:</b> Dispatcher talks to caller, computer recommends closest ambulance and response level.</p> <p><b>RESPONSE GENERATOR</b></p> <ul style="list-style-type: none"> <li>Dispatcher sends closest ALS ambulance, requests Fire Dept. AED "first response" unit</li> </ul> <p><b>ALTERNATIVES:</b> Mutual aid if no units are available.</p> <p><b>WORST SOLUTION:</b> Blind response—no caller information, no first response</p>	<p><b>ESSENTIAL INTERVENTION AND SUPPORT:</b> ECG monitoring, oxygen, IV access and appropriate medications administered (i.e., aspirin, morphine, etc.), monitoring of vital signs and oxygen saturation status, ventilatory support if needed, transport if indicated.</p> <p><b>OPTIONS TO EXIT:</b>1. TREAT &amp; LEAVE or (ALS treatment—if allowed by patient, if patient refuses PATIENT REFUSES transport to hospital, EMS explains risks, EMS leaves after obtaining signature of refusal.)</p> <p>2. TREAT &amp; TRANSPORT</p> <ul style="list-style-type: none"> <li>(ALS treatment and transport to appropriate hospital)</li> </ul> <p>3. NO CARE NEEDED</p> <ul style="list-style-type: none"> <li>(poor information or communication, no care needed)</li> </ul>	<p><b>DECISION :</b></p> <ul style="list-style-type: none"> <li>Transport to hospital with ALS treatment (unless findings encountered while following chest pain protocol has radically downgraded severity of call.)</li> <li>If no transport: <ul style="list-style-type: none"> <li>a. Fully explain risks associated with untreated or unassessed chest pain.</li> <li>b. Ask for signature if patient refuses. Offer transport again. Urge patient to call 911 again if condition worsens, or if patient becomes willing to be transported.</li> </ul> </li> </ul> <p><b>OPTIONS TO EXIT:</b></p> <p><b>ALTERNATIVES:</b> Currently very few alternatives. In future, we hope to be able to evaluate chest pain through telemedicine satellite connection with hospital physician</p>
<p><b>Richmond, VA, United States of America</b></p> <p><b>Cardiac arrest</b></p>	<p><b>BEST SOLUTION:</b> Dispatcher talks to caller, computer recommends closest ambulance and response level.</p> <p><b>RESPONSE GENERATOR</b></p> <ul style="list-style-type: none"> <li>Dispatcher sends closest ALS ambulance, requests Fire Dept. AED "first response" unit</li> </ul> <p><b>ALTERNATIVES:</b> Mutual aid if no units are available.</p> <p><b>WORST SOLUTION:</b> Blind response—no caller information, no first response</p>	<p><b>ESSENTIAL INTERVENTION AND SUPPORT:</b> CPR, application of heart monitor/defibrillator, defibrillation as appropriate, constant ECG monitoring, advanced airway maneuvers, IV access and appropriate medications administered, monitoring of vital signs and oxygen saturation status, post arrest support,</p> <p><b>OPTIONS TO EXIT:</b></p> <p>1. TREAT AND LEAVE</p> <ul style="list-style-type: none"> <li>(ALS treatment with no response, EMS ceased resuscitation, proper authorities notified.)</li> </ul> <p>2. TREAT AND REFER</p> <ul style="list-style-type: none"> <li>(ALS treatment and transport to hospital)</li> </ul> <p>3. CONFIRM DEATH</p> <ul style="list-style-type: none"> <li>(DOA = Dead on Arrival, no resuscitation attempted)</li> </ul>	<p><b>DECISION :</b></p> <ul style="list-style-type: none"> <li>Transport to hospital with ALS treatment unless DOA protocol applies.</li> <li>If no transport: <ul style="list-style-type: none"> <li>a. Turn attention to family &amp; survivors, acknowledge and facilitate the grief process</li> <li>b. Notify proper authorities</li> <li>c. (transport arranged to Medical Examiner).</li> </ul> </li> </ul> <p><b>OPTIONS TO EXIT:</b></p> <p><b>ALTERNATIVES:</b>None other at present</p>
<p><b>Western Health Board, Ireland</b></p> <p><b>Cardiac arrest</b></p>	<p>First responders G.P. Ambulance</p> <p><b>ALTERNATIVES</b></p> <p><b>WORST SOLUTION</b></p> <p><b>ESSENTIAL CARE</b></p>	<p><b>ESSENTIAL INTERVENTION AND SUPPORT</b></p> <p>Options to exit:</p> <ol style="list-style-type: none"> <li>Treat and transport</li> <li>Death confirmed by Doctor</li> <li>Transport if public place.</li> </ol>	<p><b>DECISION :</b></p> <ol style="list-style-type: none"> <li>TERTIARY / SUPER SPECIALIS</li> <li>SECONDARY</li> <li>LOCAL</li> </ol> <p>Options to exit:</p> <p><b>ALTERNATIVES:</b> Refer to primary care</p>
<p><b>Western Health Board, Ireland</b></p> <p><b>Chest pain</b></p>	<p>Emergency Ambulance</p> <p><b>RESPONSE GENERATOR</b></p> <p><b>ALTERNATIVES</b></p> <p><b>ESSENTIAL CARE</b></p>	<p><b>ESSENTIAL INTERVENTION AND SUPPORT</b></p> <p><b>OPTIONS TO EXIT:</b> Always transport unless patient refuses assistance</p>	<p><b>DECISION :</b></p> <ol style="list-style-type: none"> <li>TERTIARY / SUPER SPECIALIS</li> <li>SECONDARY</li> <li>LOCAL</li> </ol> <p><b>OPTIONS TO EXIT:</b> <b>ALTERNATIVES:</b> Refer to primary care</p>

System	Access	Switch Board	Sorting / Primary Assessment
<b>Bonn, Germany</b> <b>Chest pain &amp; Cardiac arrest</b>	1. PUBLIC KNOWLEDGE <ul style="list-style-type: none"> <li>112 is established, but some patient use 110 (police) or 1 92 92 (general practitioner on duty)2. COMMON EUROPEAN NUMBER</li> </ul>	1. TECHNICAL SORTING <ul style="list-style-type: none"> <li>Yes/No</li> </ul> 2. CALLER LINE IDENTITY <ul style="list-style-type: none"> <li>Yes, in part</li> </ul> 3. VERIFY NUMBER <ul style="list-style-type: none"> <li>Oral</li> </ul> 4. VERIFY LOCATION OF CALLER <ul style="list-style-type: none"> <li>No</li> </ul> 5. LANGUAGE <ul style="list-style-type: none"> <li>German</li> </ul>	
<b>Catabria, Spain</b> <b>Cardiac arrest</b>	Population use 061 only a small number will come through 112	1. TECHNICAL SORTING: <ul style="list-style-type: none"> <li>112 system transfers call to EMS Communications Centre only in few Cases</li> </ul> 2. CALLER LINE IDENTITY: <ul style="list-style-type: none"> <li>system automatically determines caller phone number when call comes from a digital phone centre</li> </ul> 3. VERIFY NUMBER & LOCATION OF CALLER: <ul style="list-style-type: none"> <li>dispatcher verbally asks to confirm number and location of caller, automatically we can have address when the call comes from a phone number that is in the health database</li> </ul> 4. LANGUAGE: Spanish	
<b>Catabria, Spain</b> <b>Chest pain</b>	Population use 061 only a small number will come through 112	1. TECHNICAL SORTING: <ul style="list-style-type: none"> <li>112 system transfers call to EMS Communications Centre only in few Cases</li> </ul> 2. CALLER LINE IDENTITY: <ul style="list-style-type: none"> <li>system automatically determines caller phone number when call comes from a digital phone centre</li> </ul> 3. VERIFY NUMBER & LOCATION OF CALLER: <ul style="list-style-type: none"> <li>dispatcher verbally asks to confirm number and location of caller, automatically we can have address when the call comes from a phone number that is in the health database</li> </ul> 4. LANGUAGE: Spanish	
<b>Copenhagen, Denmark</b> <b>Cardiac arrest</b>	Public 112 Emergency Phone Number  In Copenhagen to the EMS Outside Copenhagen to the Police Mobile phones transferred by phone Company	1. TECHNICAL SORTING: <ul style="list-style-type: none"> <li>Request transferred to dispatcher</li> </ul> 2. CALLER LINE IDENTITY: <ul style="list-style-type: none"> <li>automatically determines caller's phone number and address – except mobile phones</li> </ul> 3. VERIFY NUMBER & LOCATION OF CALLER: <ul style="list-style-type: none"> <li>dispatcher verbally confirms number and location of caller</li> </ul> 4. LANGUAGE: Danish and English	



System	Access	Switch Board	Sorting / Primary Assessment
<p><b>Copenhagen, Denmark</b></p> <p><b>Chest pain</b></p>	<p>Public 112 Emergency Phone Number</p> <p>In Copenhagen to the EMS Outside Copenhagen to the Police Mobile phones transferred by phone Company</p>	<p>1. TECHNICAL SORTING:</p> <ul style="list-style-type: none"> <li>Request transferred to dispatcher</li> </ul> <p>2. CALLER LINE IDENTITY:</p> <ul style="list-style-type: none"> <li>automatically determines caller's phone number and address – except mobile phones</li> </ul> <p>3. VERIFY NUMBER &amp; LOCATION OF CALLER:</p> <ul style="list-style-type: none"> <li>dispatcher verbally confirms number and location of caller</li> </ul> <p>4. LANGUAGE: Danish and English</p>	
<p><b>Garches, France</b></p> <p><b>Cardiac arrest</b></p>	<ul style="list-style-type: none"> <li>15 (national toll free number)</li> <li>112 used very seldom</li> <li>District 10 digit number</li> </ul>	<p>1. TECHNICAL SORTING:</p> <ul style="list-style-type: none"> <li>an operator transfers the call to the dispatching doctor (same premises)</li> </ul> <p>2. CALLER LINE IDENTITY:</p> <ul style="list-style-type: none"> <li>caller number displayed</li> </ul> <p>3. VERIFY NUMBER &amp; LOCATION OF CALLER:</p> <ul style="list-style-type: none"> <li>operator input data, cross checked by CAD</li> </ul> <p>4. LANGUAGE: French</p>	
<p><b>Garches, France</b></p> <p><b>Chest pain</b></p>	<ul style="list-style-type: none"> <li>15 (national toll free number)</li> <li>112 used very seldom</li> <li>District 10 digit number</li> </ul>	<p>1. TECHNICAL SORTING:</p> <ul style="list-style-type: none"> <li>an operator transfers the call to the dispatching doctor (same premises)</li> </ul> <p>2. CALLER LINE IDENTITY:</p> <ul style="list-style-type: none"> <li>caller number displayed</li> </ul> <p>3. VERIFY NUMBER &amp; LOCATION OF CALLER:</p> <ul style="list-style-type: none"> <li>operator input data, cross checked by CAD</li> </ul> <p>4. LANGUAGE: French</p>	
<p><b>Göteborg, Sweden</b></p> <p><b>Chest pain &amp; Cardiac arrest</b></p>	<p>1. PUBLIC KNOWLEDGE</p> <p>2. COMMON EUROPEAN NUMBER</p> <p>112 is well established (the old number 90000 works also in some more years)</p>	<p>1. TECHNICAL SORTING:</p> <ul style="list-style-type: none"> <li>Yes</li> </ul> <p>2. CALLER LINE IDENTITY:</p> <ul style="list-style-type: none"> <li>Computer determines caller's phonenummer and geographical location</li> </ul> <p>3. VERIFY NUMBER:</p> <ul style="list-style-type: none"> <li>Oral</li> </ul> <p>4. VERIFY LOCATION OF CALLER:</p> <ul style="list-style-type: none"> <li>Oral</li> </ul> <p>5. LANGUAGE: Swedish</p>	

System	Access	Switch Board	Sorting / Primary Assessment
<b>Helsinki, Finland</b> <b>Cardiac arrest</b>	GOOD PUBLIC KNOWLEDGE OF COMMON EUROPEAN NUMBER "112" <ul style="list-style-type: none"> <li>connects caller to one dispatcher processing EMS, fire and police without transfer or relay</li> <li>dispatcher non-medical, non-policenational education</li> </ul>	1. TECHNICAL SORTING: <ul style="list-style-type: none"> <li>not needed</li> </ul> 2. CALLER LINE IDENTITY: <ul style="list-style-type: none"> <li>shows number secret numbers --&gt; police</li> </ul> 3. VERIFY NUMBER: <ul style="list-style-type: none"> <li>verbally verified also</li> </ul> 4. VERIFY LOCATION OF CALLER: <ul style="list-style-type: none"> <li>automatic if fixed line GPS if mobile and needed</li> </ul> 5. LANGUAGE: Finnish, English, (Swedish)	
<b>Helsinki, Finland</b> <b>Chest pain</b>	GOOD PUBLIC KNOWLEDGE OF COMMON EUROPEAN NUMBER "112" <ul style="list-style-type: none"> <li>connects caller to one dispatcher processing EMS, fire and police without transfer or relay</li> <li>dispatcher non-medical, non-policenational education</li> </ul>	1. TECHNICAL SORTING: <ul style="list-style-type: none"> <li>not needed</li> </ul> 2. CALLER LINE IDENTITY: <ul style="list-style-type: none"> <li>shows number secret numbers --&gt; police</li> </ul> 3. VERIFY NUMBER: <ul style="list-style-type: none"> <li>verbally verified also</li> </ul> 4. VERIFY LOCATION OF CALLER: <ul style="list-style-type: none"> <li>automatic if fixed line GPS if mobile and needed</li> </ul> 5. LANGUAGE: Finnish, English, (Swedish)	
<b>INEM Portugal</b> <b>Chest pain &amp; Cardiac arrest</b>	Individual Electronic registration  Number of calls waiting for attending  Beginning of the call Attending Dispatching End of the call  <ul style="list-style-type: none"> <li>Working on medical study for the timing of calls (almost finished)</li> <li>Untill now, no calls waiting</li> </ul> People Know they have to contact 112 in such condition.  Call is transfered(66% of the population) to EMS Dispatch Center.  112 or EMS Dispatch: Medical vehicle – 20 in all the country Or Ambulance - BLS or helicopter	1. TECHNICAL SORTING: <ul style="list-style-type: none"> <li>Protocol (wich is going to be modified soon ProqA)</li> </ul> 2. CALLER LINE IDENTITY: <ul style="list-style-type: none"> <li>Yes, except those wich are confidential in PT3.</li> </ul> VERIFY NUMBER: <ul style="list-style-type: none"> <li>Yes4.</li> </ul> 4. VERIFY LOCATION OF CALLER: <ul style="list-style-type: none"> <li>no</li> </ul> 5. LANGUAGE: <ul style="list-style-type: none"> <li>officially portuguese others: depends of the operator</li> </ul>	Decision tree - immediate

System	Access	Switch Board	Sorting / Primary Assessment
<p><b>Kufstein, Austria</b></p> <p><b>Chest pain &amp; Cardiac arrest</b></p>	<p>1.PUBLIC KNOWLEDGE 144</p> <p>2.COMMON EUROPEAN NUMBER 112 is established at the police</p>	<p>1.CALLER LINE IDENTITY:</p> <ul style="list-style-type: none"> <li>(ANI/ALI system automatically determines only caller phone number)</li> </ul> <p>2.ADRRESS OF EMERGENCY:</p> <ul style="list-style-type: none"> <li>is asked by the Dispatcher</li> </ul> <p>3.VERIFY NUMBER &amp; LOCATION OF CALLER:</p> <ul style="list-style-type: none"> <li>(dispatcher verbally confirms number and location of caller)</li> </ul> <p>4. LANGUAGE: German, Part Time: English and Italian</p>	
<p><b>Leuven, Belgium</b></p> <p><b>Chest pain &amp; Cardiac arrest</b></p>	<p>1.PUBLIC KNOWLEDGE 100-112 system generating emergency health care response advocated by</p> <ul style="list-style-type: none"> <li>TV spots</li> <li>General public campaigns</li> <li>newspaper articles</li> <li>education in schools</li> <li>healthcare organisations (red cross, ...)</li> </ul> <p>2.COMMON EUROPEAN NUMBER</p> <ul style="list-style-type: none"> <li>112 is automatically diverted to 100 dispatch center</li> <li>101 (police alarm number) – 8-10 % of 101 calls are for medical intervention = manually diverted to 100 dispatch center</li> </ul>	<p>1. TECHNICAL SORTING:</p> <ul style="list-style-type: none"> <li>none</li> </ul> <p>2. CALLER LINE IDENTITY:</p> <ul style="list-style-type: none"> <li>CAD determines automatically caller and location of telephone number in case of fixed telephone – mobiles theoretically possible by contacting operators</li> <li>-Problem: mobile phones (prepaid cards)</li> </ul> <p>3. VERIFY NUMBER:</p> <ul style="list-style-type: none"> <li>dispatcher checks orally</li> </ul> <p>4. VERIFY LOCATION OF CALLER: dispatcher checks orally</p> <p>5.LANGUAGE: French, Dutch, English, German</p>	
<p><b>Richmond, VA, United States of America</b></p> <p><b>Cardiac arrest</b></p>	<p>1."Enhanced 911" Emergency Telephone Number (transferred directly from the primary PSAP (Public Safety Answering Point)).</p> <p>2. Rarely, request may arrive directly in Communications Center via 7-digit non-emergency telephone number.</p>	<p>1. TECHNICAL SORTING:</p> <ul style="list-style-type: none"> <li>911 system transfers call to EMS Communications Center</li> </ul> <p>2. CALLER LINE IDENTITY:</p> <ul style="list-style-type: none"> <li>ANI/ALI system automatically determines caller phone number and address</li> </ul> <p>3. VERIFY NUMBER &amp; LOCATION OF CALLER:</p> <ul style="list-style-type: none"> <li>dispatcher verbally confirms number and location of caller</li> </ul> <p>4. LANGUAGE: English</p>	

System	Access	Switch Board	Sorting / Primary Assessment
<p><b>Richmond, VA, United States of America</b></p> <p><b>Chest pain</b></p>	<p>1. "Enhanced 911" Emergency Telephone Number (transferred directly from the primary PSAP (Public Safety Answering Point)).</p> <p>2. Rarely, request may arrive directly in Communications Center via 7-digit non-emergency telephone number. are transported to a full-service hospital for evaluation.</p>	<p>1. TECHNICAL SORTING:</p> <ul style="list-style-type: none"> <li>911 system transfers call to EMS Communications Center</li> </ul> <p>2. CALLER LINE IDENTITY:</p> <ul style="list-style-type: none"> <li>ANI/ALI system automatically determines caller phone number and address</li> </ul> <p>3. VERIFY NUMBER &amp; LOCATION OF CALLER:</p> <ul style="list-style-type: none"> <li>dispatcher verbally confirms number and location of caller</li> </ul> <p>4. LANGUAGE: English</p>	
<p><b>Western Health Board, Ireland</b></p> <p><b>Cardiac arrest</b></p>	<p>1. PUBLIC KNOWLEDGE</p> <ul style="list-style-type: none"> <li>Various awareness programmes etc</li> <li>999, most commonly used</li> </ul> <p>2. 112 used mainly on mobile phones.</p>	<p>1. MANUAL SORTING:</p> <ul style="list-style-type: none"> <li>daytime EMT controllers, night time switchboard operators.</li> </ul> <p>2. CALLER LINE IDENTITY:</p> <ul style="list-style-type: none"> <li>Not supplied by telco</li> </ul> <p>3. VERIFY NUMBER</p> <p>4. VERIFY LOCATION OF CALLER</p> <p>5. LANGUAGE: some areas bilingual.</p>	
<p><b>Western Health Board, Ireland</b></p> <p><b>Chest pain</b></p>	<p>1. PUBLIC KNOWLEDGE</p> <ul style="list-style-type: none"> <li>Various awareness programmes etc</li> <li>999, most commonly used</li> </ul> <p>2. 112 used mainly on mobile phones.</p>	<p>1. MANUAL SORTING:</p> <ul style="list-style-type: none"> <li>daytime EMT controllers, night time switchboard operators.</li> </ul> <p>2. CALLER LINE IDENTITY:</p> <ul style="list-style-type: none"> <li>Not supplied by telco</li> </ul> <p>3. VERIFY NUMBER</p> <p>4. VERIFY LOCATION OF CALLER</p> <p>5. LANGUAGE: some areas bilingual.</p>	

System	Transport	Handover/Disposal	Outcome
<b>Bonn, Germany</b> <b>Chest pain &amp; Cardiac arrest</b>	MOST EFFECTIVE LOCAL SYSTEM SOLUTION: <ul style="list-style-type: none"> <li>Transport by RTW</li> </ul>	OPTIONS: <ul style="list-style-type: none"> <li>All options available, depends on hospital</li> </ul> EMERGENCY ROOM Atrium CORONARY CARE INTENSIVE CARE	RECORD DIAGNOSIS: <ul style="list-style-type: none"> <li>Epicrisis in 40% of patients.</li> </ul> AUDIT : <ul style="list-style-type: none"> <li>Audit of EMS / ALS protocols by „Ärztlicher Leiter Rettungsdienst“.</li> </ul> CLINICAL GOVERNANCE
<b>Cantabria, Spain</b> <b>Cardiac arrest</b>	MOST EFFECTIVE LOCAL SYSTEM SOLUTION: <p>In Cantabria only those ROSC are transported to a full-service hospital for post resuscitation care.</p>	EMERGENCY ROOM CORONARY CARE INTENSIVE CARE 24-HOUR OBSERVATION	RECORD DIAGNOSIS: No AUDIT: No routinely CLINICAL OVERSIGHT: No HOSPITAL OUTCOME: No
<b>Cantabria, Spain</b> <b>Chest pain</b>	MOST EFFECTIVE LOCAL SYSTEM SOLUTION	EMERGENCY ROOM MEDICAL FLOOR <ul style="list-style-type: none"> <li>CATHETERIZATION LAB</li> </ul> CORONARY CARE <ul style="list-style-type: none"> <li>TRANSFER TO A MORE APPROPRIATE HOSPITAL</li> </ul> INTENSIVE CARE 24-HOUR OBSERVATION	RECORD DIAGNOSIS: No AUDIT: No routinely CLINICAL OVERSIGHT: No HOSPITAL OUTCOME: No
<b>Copenhagen, Denmark</b> <b>Cardiac arrest</b>	MOST EFFECTIVE LOCAL SYSTEM SOLUTION: <p>all cardiac arrest victims resuscitated are transported to a ED/ICU at appropriate hospital</p> <p>for coronary care / invasive procedure  MICC confirmation</p>	EMERGENCY DEPT - MORGUE ICU or CCU CATHETERIZATION LAB	RECORD DIAGNOSIS: <ul style="list-style-type: none"> <li>Assessment codes from physicians documentation and ICD9 codes</li> </ul> AUDIT: <ul style="list-style-type: none"> <li>All cardiac arrest calls are reviewed by the physician and entered into cardiac arrests research database, Utstein Style template</li> </ul> CLINICAL OVERSIGHT: <ul style="list-style-type: none"> <li>Medical Director monitors delivery of care for cardiac arrest</li> </ul> HOSPITAL OUTCOME: <ul style="list-style-type: none"> <li>Follow up of of all Cardiac arrests for a national database (social security number)</li> </ul>
<b>Copenhagen, Denmark</b> <b>Chest pain</b>	MOST EFFECTIVE LOCAL SYSTEM SOLUTION <p>all patients with chest pain (and suspected cardiac origin) are transported to a ED at appropriate hospital</p> <p>-for coronary care / invasive procedure  MICC confirmation</p>	EMERGENCY DEPT ICU or CCU CATHETERIZATION LAB	RECORD DIAGNOSIS: <ul style="list-style-type: none"> <li>Assessment codes from physicians documentation and ICD9 codes</li> </ul> AUDIT: <ul style="list-style-type: none"> <li>Selected cases are reviewed</li> </ul> CLINICAL OVERSIGHT: <ul style="list-style-type: none"> <li>QA – Deviation from standard of Care in database</li> </ul> HOSPITAL OUTCOME: Follow up of of all patients admitted to hospital (social security number)

System	Transport	Handover/Disposal	Outcome
<b>Garches, France</b> <b>Cardiac arrest</b>	DEPENDS ON SUCCESS OF CPR: <ol style="list-style-type: none"> <li>1. LOS dead, without attempt of resuscitation*</li> <li>2. LOS dead, with inefficiency of resuscitation*</li> <li>3. Transported to hospital (ICU)</li> <li>4. Transported to hospital (ED)</li> <li>5. LOS: simulation Death certificate delivered if no legal constraint</li> </ol>	ICU or ED	RECORD DIAGNOSIS:  AUDIT:  CLINICAL GOUVERNANCE:
<b>Garches, France</b> <b>Chest pain</b>	SEE ACS STRATEGY ON SCENE, MADE BY MD: <ul style="list-style-type: none"> <li>• This is a typical cardiac chest pain or there is a moderate risk: patient transported by ALS ambulance</li> <li>• There is no or little risk of CHD: transport by non medical means</li> <li>• For stable angina or non CHD: left on scene</li> <li>• For cardiac arrest: transport by ALS ambulance</li> </ul>	SEE ACS STRATEGY: <ol style="list-style-type: none"> <li>1. Level 1 : left on scene,</li> <li>2. Level 2: BLS to ED</li> <li>3. Level 3: ALS to ED or ICCU</li> <li>4. Level 4: ALS to ICCU + cathlab</li> <li>5. Level 5: ALS to ICCU + cathlab</li> </ol>	RECORD DIAGNOSIS:  AUDIT:  CLINICAL GOUVERNANCE:
<b>Gothenburg, Sweden</b> <b>Chest pain &amp; Cardiac arrest</b>	MOST EFFECTIVE LOCAL SYSTEM SOLUTION:  Transport to desired hospital (or nearest) or hospital with PTCA facilities	OPTIONS: <ul style="list-style-type: none"> <li>• All options available, depends on hospital EMERGENCY ROOM</li> </ul> ATRIUM CORONARY CARE INTENSIVE CARE	RECORD DIAGNOSIS: <ul style="list-style-type: none"> <li>• EMS "diagnosis" is recorded</li> </ul> AUDIT: <ul style="list-style-type: none"> <li>• Some of the cases are followed up by physician</li> </ul> CLINICAL OVERSIGHT: No
<b>Helsinki, Finland</b> <b>Cardiac arrest</b>	MOST EFFECTIVE LOCAL SYSTEM SOLUTION:  Transportation by ambulance escorted by (HEMS) physician	EMERGENCY ROOM  ATRIUM INTENSIVE CARE	RECORD DIAGNOSIS (entered into database): <ul style="list-style-type: none"> <li>• Immediate feed-back from hospital Clinical report from hospital (not always) Autopsy report from coroner (always) Utstein style recording</li> </ul> AUDIT: <ul style="list-style-type: none"> <li>• Monthly staff meeting: compliance with SOPs ? * medical director * contractor's M.D. Contacts from hospital/local EMS</li> </ul> CLINICAL GOUVERNANCE

System	Transport	Handover/Disposal	Outcome
<p><b>Helsinki, Finland</b></p> <p><b>Chest pain</b></p>	<p>MOST EFFECTIVE LOCAL SYSTEM SOLUTION:</p> <p>Transportation by ambulance, escorted by (HEMS) physician if indicated</p>	<p>EMERGENCY ROOM</p> <p>ATRIUM CATH LAB CORONARY CARE INTENSIVE CARE</p>	<p>RECORD DIAGNOSIS (entered into database):</p> <ul style="list-style-type: none"> <li>Immediate feed-back from hospital Clinical report from hospital (not always) Autopsy report from coroner (always)</li> </ul> <p>AUDIT:</p> <ul style="list-style-type: none"> <li>Monthly staff meeting: compliance with SOPs ? * medical director * contractor's M.D. Contacts from hospital/local EMS</li> </ul> <p>CLINICAL GOUVERNANCE</p>
<p><b>INEM, Portugal</b></p> <p><b>Chest pain &amp; Cardiac arrest</b></p>	<ul style="list-style-type: none"> <li>Emergency Ambulance</li> <li>Helicopter inter-hospital or primary missions (on scene)</li> <li>Other ambulances</li> </ul>	<p>EMERGENCY ROOM CORONARY CARE</p> <p>INTENSIVE CARE</p>	<p>RECORD DIAGNOSIS:</p> <ul style="list-style-type: none"> <li>Only individual records</li> </ul> <p>AUDIT:</p> <ul style="list-style-type: none"> <li>Audit in confluent circumstances</li> </ul> <p>CLINICAL OVERSIGHT:</p> <ul style="list-style-type: none"> <li>Waiting soon for medical protocol with international medical accreditation</li> <li>In process of accreditation on Individual Data Commission (Parliament)</li> </ul>
<p><b>Kufstein, Austria</b></p> <p><b>Chest pain &amp; Cardiac arrest</b></p>	<p>MOST EFFECTIVE LOCAL SYSTEM SOLUTION:</p> <p>In Austria, all chest pain patients <i>who do not refuse care</i> are transported to a full-service hospital for evaluation.</p> <p>In Innsbruck, all cardiac arrest victims receiving EMS care on the scene. It's the decision of the Emergency Physician, to transport the patient.</p>	<p>EMERGENCY ROOM - MORGUE</p> <p>CORONARY CARE CATHETERIZATION LAB INTENSIVE CARE TRANSFER TO A MORE APPROPRIATE HOSPITAL</p> <p>MEDICAL FLOOR 24-HOUR OBSERVATION</p> <p>DISCHARGE HOME</p>	<p>RECORD DIAGNOSIS: No</p> <p>AUDIT:</p> <ul style="list-style-type: none"> <li>Random chest pain calls are reviewed by the QI process of the DC, All cardiac arrest calls are reviewed by the QI process of the DC</li> </ul> <p>CLINICAL OVERSIGHT:</p> <ul style="list-style-type: none"> <li>Medical Director of ALS System monitors partial delivery of care</li> </ul> <p>HOSPITAL OUTCOME:</p> <ul style="list-style-type: none"> <li>We are not currently receiving any outcome information from hospitals related to chest pain and arrest outcomes.</li> </ul>
<p><b>Leuven, Belgium</b></p> <p><b>Cardiac arrest</b></p>	<p>All non-deaths CA victims are transported by MIVA team and MUG to definitive cardiac pathology A hospital facility</p>	<p>EMERGENCY DEPARTMENT:</p> <ul style="list-style-type: none"> <li>diagnosis</li> <li>therapy (post resuscitation care for 24-48 h) handover/confirmation of appropriate dismissal</li> </ul> <p>DISMISSAL TO:</p> <ul style="list-style-type: none"> <li>CCU</li> <li>Cath lab</li> <li>Operating theatre</li> <li>Morgue</li> <li>ED observational care unit : post resuscitation care for 24-48 h</li> <li>Medical floor (after 24 h minimum)</li> </ul>	<p>RECORD DIAGNOSIS:</p> <ul style="list-style-type: none"> <li>on medical file: ICD-9 diagnosis when leaving the ED and when leaving the hospital</li> </ul> <p>AUDIT:</p> <ul style="list-style-type: none"> <li>question/incident driven medical, nursing, system, process, outcome, ... performance indicators (Q programme)</li> </ul> <p>CLINICAL GOUVERNANCE:</p> <ul style="list-style-type: none"> <li>EP staff member</li> </ul>

System	Transport	Handover/Disposal	Outcome
<p><b>Leuven, Belgium</b></p> <p><b>Chest pain</b></p>	<p>MIVA: nurse accompanied / support: standing orders MIVA + MUG : doctor accompanied: continuing already started medical definitive and supportive therapy</p>	<p>EMERGENCY DEPARTMENT:</p> <ul style="list-style-type: none"> <li>• diagnosis</li> <li>• therapy</li> <li>• observation 6-12 h or 24 h</li> </ul> <p>fine diagnose effectiveness therapy appropriate dismissal</p> <p>DISMISSAL TO:</p> <ul style="list-style-type: none"> <li>• home</li> <li>• CCU/Intensive Care</li> <li>• Cath lab/Operating theatre</li> <li>• hospital ward</li> </ul>	<p>RECORD DIAGNOSIS:</p> <ul style="list-style-type: none"> <li>• on medical file: ICD-9 diagnosis when leaving the ED and when leaving the hospital</li> </ul> <p>AUDIT:</p> <ul style="list-style-type: none"> <li>• question/incident driven medical, nursing, system, proces, outcome, ... performance indicators (Q programme)</li> </ul> <p>CLINICAL GOVERNANCE:</p> <ul style="list-style-type: none"> <li>• EP stafmember</li> </ul>
<p><b>Richmond, VA. United States of America</b></p> <p><b>Cardiac arrest</b></p>	<p>MOST EFFECTIVE LOCAL SYSTEM SOLUTION: In Richmond, all cardiac arrest victims receiving EMS care on the scene <i>NOT meeting the test of the DOA protocol</i> are transported to a full-service hospital for continued resuscitation.</p>	<p>EMERGENCY ROOM - MORGUE</p> <p>CORONARY CARE CATHETERIZATION LAB</p> <p>INTENSIVE CARE TRANSFER TO A MORE APPROPRIATE HOSPITAL</p> <p>MEDICAL FLOOR 24-HOUR OBSERVATION</p> <p>DISCHARGE HOME</p>	<p>RECORD DIAGNOSIS:</p> <ul style="list-style-type: none"> <li>• Assessment codes from paramedic documentation, which later are converted to applicable ICD9's.</li> </ul> <p>AUDIT:</p> <ul style="list-style-type: none"> <li>• All cardiac arrest calls are reviewed by the QI process and entered into cardiac arrests research database, then reported in Utstein Style template.</li> </ul> <p>CLINICAL OVERSIGHT:</p> <ul style="list-style-type: none"> <li>• Medical Director monitors delivery of care for cardiac arrest.</li> </ul> <p>HOSPITAL OUTCOME:</p> <ul style="list-style-type: none"> <li>• This has been very difficult to obtain in the United States, must be individually requested to determine which of the following outcomes applies: <ol style="list-style-type: none"> <li>1. Died in Emergency Room.</li> <li>2. Admitted to hospital.</li> <li>3. Died after admission (intensive care unit, etc.).</li> <li>4. Discharged alive.</li> </ol> </li> </ul>



System	Transport	Handover/Disposal	Outcome
<p><b>Richmond, VA, United States of America</b></p> <p><b>Chest pain</b></p>	<p>MOST EFFECTIVE LOCAL SYSTEM SOLUTION:</p> <p>In Richmond, all chest pain patients <i>who do not refuse care</i> are transported to a full-service hospital for evaluation.</p>	<p>EMERGENCY ROOM - MORGUE</p> <p>CORONARY CARE</p> <p>CATHETERIZATION LAB</p> <p>INTENSIVE CARE TRANSFER TO A MORE APPROPRIATE HOSPITAL</p> <p>MEDICAL FLOOR 24-HOUR OBSERVATION</p> <p>DISCHARGE HOME</p>	<p>RECORD DIAGNOSIS:</p> <ul style="list-style-type: none"> <li>Assessment codes from paramedic documentation, which later are converted to applicable ICD9's.</li> </ul> <p>AUDIT:</p> <ul style="list-style-type: none"> <li>Random chest pain calls are reviewed by the QI process.</li> </ul> <p>CLINICAL OVERSIGHT:</p> <ul style="list-style-type: none"> <li>Medical Director monitors delivery of care for chest pain as part of QI process and/or on event arrest.</li> </ul> <p>HOSPITAL OUTCOME:</p> <ul style="list-style-type: none"> <li>This has been very difficult to obtain in the United States. We are not currently receiving any outcome information from hospitals related to chest pain outcomes.</li> </ul>
<p><b>Western Health Board, Ireland</b></p> <p><b>Cardiac arrest</b></p>	<p>MOST EFFECTIVE LOCAL SYSTEM SOLUTION :</p> <p>All ambulances are Frontline Emergency Ambulances.</p>	<p>EMERGENCY ROOM</p>	<p>RECORD DIAGNOSIS</p> <p>AUDIT</p>
<p><b>Western Health Board, Ireland</b></p> <p><b>Chest pain</b></p>	<p>Emergency Ambulance with 2 EMT's</p>	<p>EMERGENCY ROOM</p>	<p>AUDIT</p>

**Table 1: "Patient Journey" by system**

**Appendix 4:**  
**Data availability by system from runsheet information**

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Demographics			
	Age	Sex	Ethnicity
Austria	+	+	-
Belgium	+	+	-
Denmark	+	+	-
Finland	+	+	-
France	+	+	-
Germany	+	+	-
Ireland	+	+	-
Italy	+	+	-
Portugal	+	+	-
Spain	+	+	-
Sweden	+	+	-
United Kingdom	+	+	-
United States of America	+	+	+

**Table 2: Data availability by system: Demographics**

Times										
	Time of Call (run sheets)	Unit notified (USA)/ time of alarm (D) / dispatch time (FIN, DK)	Departure station/ Unit responding (USA)	Arrival at the scene (not at the patient)	Patient contact	Departure from scene	Arrival destination (B, USA)/ arrival hospital (DK, D, E, UK, I, FIN)/ handover/ disposal (A, D, P)	Time back At station (B)/ time in service (USA)/ available again (DK, D, P, I)/ end of mission (FIN)/time clear (UK)	Time end mission	Time start/end medical care (physician contact)
Austria	-	+	+	+	-	+	-	+	-	-
Belgium	+	+	+	+	-	+	+	+	-	-
Denmark	+	+	-	+	-	+	+	+	+	-
Finnland	+	+	-	+	+	+	+	+	-	-
France	-	-	+	+	+	-	+	+	+	+
Germany	-	+	-	-	+	-	+	-	-	-
Ireland	+	+	+	+	-	+	+	-	-	-
Italy	-	-	+	+	-	-	+	-	-	-
Portugal	-	+	+	+	-	+	+	+	-	-
Spain	-	+	+	+	-	+	+	-	-	-
Sweden	-	+	-	-	+	?	+	+	-	-
United Kingdom	-	+	-	+	+	+	+	+	-	-
United States of America	+	+	+	+	+	+	+	+	-	-

**Table 3: Data availability by system: Times**

Diagnosis							
	Pre-existing condition	Signs and Symptoms/ Complaints	Working diagnosis	Mechanism of injury/ Cause of trauma	Localisation of trauma	Allergies	Current medication
Austria	+	+	EP	+	+	-	+
Belgium	+	+	MUG nurse	+	+	-	-
Denmark	+	+	EP	+	+	-	EP
Finnland	+	+	Physician	+	+	+	+
France	+	+	+	+	+	-	+
Germany	+	+	+	+	+	-	+
Ireland	+	+	+	-	+	+	+
Italy	+	+	+	+	+	-	+
Portugal	+	+	Physician	+	+	-	+
Spain	+	-	+	+	+	+	+
Sweden	+	+	Physician	+	+	-	+
United Kingdom	+	+	+	+	+	-	+
United States of America	+	+	+	+	+	+	Medication allergies

**Table 4: Data availability by system: Diagnosis**

Clinical data / Initial Observations												
	AVPU	GCS	Pulse rate	Respiratory rate	ECG rhythm (ALS)	Pain	Sat O <sub>2</sub> / SP O <sub>2</sub> (ALS)	Systolic arterial tension	Diastolic arterial tension	Blood sugar level	Temperature	Et CO <sub>2</sub>
Austria	-	+	+	+	+	+	+	+	+	+	-	+
Belgium	-	+	+	+	+	-	+	+	+	+	-	+
Denmark	-	+	+	+	+	+	+	+	+	+	-	+
Finnland	-	+	+	+	+	+	+	+	+	+	-	+
France	-	+	+	-	+	+	+	+	+	+	+	+
Germany	-	+	+	+	+	+	+	+	+	+	+	+
Ireland	+	+	+	+	+	+	+	+	+	+	-	+
Italy	BLS	+	+	+	+	-	+	+	+	+	+	-
Portugal	-	+	+	+	+	-	+	+	+	+	-	-
Spain	+	+	+	+	+	+	+	+	+	+	-	+
Sweden	+	+	+	+	+	+	+	+	+	+	+	+
United Kingdom	+	+	+	+	+	+	+	+	+	+	-	-
United States of America	+	+	+	+	+	+	+	+	+	+	-	+

**Table 5: Data availability by system: Clinical Data / Initial Observations**

Intervention (1)								
	Intubation	O2	Mechanical Ventilation	Detailed Data on Mechanical Ventilation	Venous Catheter/venous Access	Gastric Tube	Medication/ drugs	Thrombolysis
Austria	+	+	+	+	+	+	+	+
Belgium	+	+	+	+	+	+	MUG	-
Denmark	+	+	+	-	+	+	+	-
Finnland	+	+	+	-	+	+	+	+
France	+	+	+	+	+	+	+	+
Germany	+	+	+	+	+	+	+	-
Ireland	-	+	-	-	-	-	+	-
Italy	+	+	+	-	+	+	+	+
Portugal	+	+	+	-	+	+	+	+
Spain	+	+	+	+	+	+	+	-
Sweden	+	+	+	+	+	+	+	+
United Kingdom	+	+	+	-	+	-	+	+
United States of America	+	+	-	-	+	+	+	-

**Table 6: Data availability by system: Intervention (1)**

Intervention (2)								
	CPR/ Cardiac Massage	Collapse witnessed by Bystander or not	Rhythm	Bystander CPR	Defibrillation	Time of permanent ROSC as per Utstein	Time of first shock	Time of arrest
Austria	+	+	+	+	+	+	-	+
Belgium	+	+	+	+	+	+	?	?
Denmark	+	+	+	+	+	+	+	+
Finnland	+	+	+	+	-	+	+	-
France	+	-	+	-	+	-	+	-
Germany	+	-	+	+	+	+	+	+
Ireland	+	+	+	+	+	-	+	-
Italy	+	+	+	+	+	+	+	+
Portugal	+	-	+	-	+	-	+	+
Spain	+	-	+	+	+	+	+	+
Sweden	+	+	+	+	+	+	+	+
United Kingdom	+	+	+	+	+	+	+	+
United States of America	+	+	+	+	+	+	+	+

**Table 7: Data availability by system: Intervention (2)**

Additional Information			
	Transfusion documentation (blood)	Verification of death/ death confirmed	Electronic Database available?
Austria	-	EP	+
Belgium	-	Physician	+
Denmark	-	EP	
Finnland	-	+	
France	+	Physician	
Germany	-	EP	+
Ireland	-	-	
Italy	-	+	
Portugal	-	Physician	
Spain	-	Physician	
Sweden	-	-	
United Kingdom	-	+	
United States of America	-	+	

**Table 8: Data availability by system: Additional information**

**Appendix 5:**  
**Short description of sample EMS systems**

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## **Austria**

### **EMS Dispatch Centre, Tyrol, Innsbruck and**

### **Red Cross Ambulance Service, Kufstein**

The EMS Dispatch Centre, Tyrol, Austria, included in the Emergency Data Project only information from the district of Kufstein (95,000 inhabitants). The Dispatch Center supports a much larger region (350,000 inhabitants), but the Red Cross District of Kufstein offered the best data for the project.

#### **Past, Present and Future**

The Red Cross Kufstein was founded in the year 1936 as a small but from the beginning, successful ambulance service.

The time between the end of the Second World War and the beginning of the 1990s was the defining period for the present service. The Ambulance Service increased year on year and new Ambulance Stations were founded. The entire district is now supplied from 4 bases, 2 ALS units (1991 and 1996), one HEMS, 4 BLS units and up to 10 Patient Transport Ambulances available each day. In the year 2000 the whole organisation was ISO 9000 certificated, which was a unique step for an Ambulance Service in Austria.

In the year 2002, the Red Cross district of Kufstein joined the former Dispatch Centre, Tyrol Middle (now Dispatch Centre Tyrol), which offers the service to 4 Red Cross districts in the region around Innsbruck. The Dispatch Centre was founded in the year 2000. The Dispatch Centre handles up to 100 emergency responses and more than 400 patient transports every day. Two HEMS helicopters are dispatched directly by the supervisors, and all 14 HEMS helicopters in Tyrol, which feed

the University Hospital in Innsbruck, are under the supervision and control of the Dispatch Centre Tyrol.

#### **Strengths**

The Red Cross Kufstein and the Dispatch Centre Tyrol has great strengths and assets.

- Most importantly, the highly motivated young dispatchers who are 100% there for the patient, and very committed.
- Advanced, evidence-based treatment.
- The Dispatch Centre uses the AMPDS System to prioritise emergency calls, and to dispatch ALS and BLS units.

#### **Weaknesses**

Throughout Austria, there is no overall controlling system for EMS and the standards are set by each individual Ambulance Service. The self-defined standards in Kufstein are very high, compared with others in Austria, but an overall system for benchmarking would be necessary and helpful for standard-setting nationally.

#### **Opportunities**

There is a perfect opportunity to create a successful unified EMS system in the Red Cross Ambulance district of Kufstein and in the Dispatch Centre Tyrol. The team is ready to accept change and develop new ways of delivering evidence-based care. Although the health service in Austria is very well organised, Kufstein has generally been one step ahead. For example, in the mid-80s, they used half automatic defibrillation in every emergency responder car in the district.



**Threats**

The threats to the Kufstein system are similar to those in every other European EMS. Finance is a very important issue for every company and we are close to a funding collapse in our health system. The financial situation of our insurance is very tight. We hope we can provide the present standards of treatment and care in the future, whilst managing workload and becoming more efficient.

**Summary**

The healthcare and EMS systems in Kufstein, and the associated Dispatch Centre, work well together. The European Emergency Data project has been a valuable co-operative project, with many shared lessons. It points the way to development of EMS in the future. Kufstein looks forward to participating in future projects.

## **Belgium**

### **Leuven Emergency Medical Services 100 (112) system, Leuven**

#### **Past and present of the Belgian System**

The Belgian Emergency Medical Service System as an organized system did not exist until 1958. Following an incident in the region of Brussels which provoked a huge press campaign, the government decided that the local commissions of welfare (COO) had to foresee - for everyone in need of urgent medical care after an accident or in case of acute illness - in:

- medical care on the scene by a doctor,
- transportation by an ambulance to a hospital,
- admittance to a hospital.

A second incident and press campaign provoked in 1964 the publication of the Law on Emergency Medical Assistance for every person in need of urgent medical care while being at a public place. Since 1998, this law is also applicable to every person being at a private place.

This law foresees in:

- a unified call and dispatch centre, 100 (112) call centre,
- first care on the scene,
- transport by an ambulance,
- admittance to the specialized emergency department of the nearest or most appropriate hospital.

In 1995 Mobile Emergency Groups (MUG) were installed. These rapid intervention teams consist of a physician and a nurse trained in emergency care. They are sent by the dispatch centre to the patient in specialized, fully equipped, small intervention cars and provide,

if necessary, first care, including resuscitation care and are also responsible for accompanying the victim to the most appropriate hospital. These MUG-teams are all hospital based. 80 MUG-teams are operational over the country, scattered on population density based criteria.

The ambulances are either run by the Government or by a private, but government controlled, organization. In addition, the government imposes standards on qualification and training (content, format, quality) of the ambulance crew, equipment of ambulances and intervention cars, qualification and training of MUG crews and accreditation standards of emergency departments.

The 100 centre takes and dispatches only calls for emergency medical assistance and for fire intervention. This means that a pre-triage is made by the public based on kind and seriousness of the call. For police assistance there is a separate number, 101 and a separate dispatch centre.

The 100 centres receive about 80 % of their calls for medical assistance and 20 % of their calls for fire department help.

The dispatch system still has to be computerized to provide the stake holders (government and emergency services) with the necessary data on the running and demands of the system.

Also the communication equipment needs to be renewed and nowadays it cannot meet the modern expectations as delivered by an integrated dispatch system.

Financing of the system is based on fee for service. The fee is imposed by the government and paid by the victim, who can, depending on his health insurance company, claim a partial refund.

Especially for the private organizations and hospitals the financing is highly insufficient to meet all the imposed standards of quality and imposed rules.

All other secondary transports of patients are organized outside the 100 emergency medical system on a non structural, non controlled or regulated manner.

The role of the general practitioner (GP) in Belgium is the subject of a debate. In an attempt to cut back on hospitals costs, the government is implying new rules for hospital admission. People should first visit their GP before entering into the hospital system. The government implies financial incentives to do so, but until now this policy seems not to have great success.

The increasing demand on high standards of care by the Belgian people, a care that is expected to be available 24 h a day, 7 days a week without any waiting time will be the challenge for the future.

### **The Leuven System**

The Leuven system is a collaboration between the University Hospitals Leuven, the Regional Hospital H.-Hart Leuven, The Fire Department of the City and the Flemish Cross and Red Cross services.

The regional 100-dispatch centre is situated in the chief fire station near the University Hospital. From the beginning (in 1998) the 100 dispatch has always been supervised by a medical doctor, from 1998 till end 2003 by the lieutenant-physician of the Fire Department and from 2004 by a staff member of the University Hospitals' Emergency Department. This staff member is also responsible for the management of the whole hospital based emergency care system (MIVA and MUG).

The 100 (112) call takers-dispatchers are all civilians and paid for by the city of Leuven with governmental support by the Ministry of Internal Affairs. At the opening of the Leuven dispatch centre in 1988, they all received a 6 month training. Nowadays, the new recruits get their training on the job by lack of financial support.

In collaboration with the University Hospital the system is provided with: 3 MIVA teams, consisting of an ambulance driver and an accredited and specially trained nurse; 2 ambulance teams consisting of two ambulance men; and 2 MUG-teams consisting of a MIVA-nurse and an emergency physician.

The emergency care system provides systematically all emergency care responses for the city of Leuven and its surroundings. It also provides the intensive care inter-hospital transfers for the University Hospitals, which are a secondary and tertiary referral centre for the Flemish region of Belgium (about 55 % of the Territory). The 2 MUG-teams provide the coverage of a vast area (300 km<sup>2</sup> and ± 200 000 inhabitants).

There is only limited triage of calls at the level of the dispatch centre. For every call, the nearest ambulance is dispatched. First the MIVA-teams are sent out and only when these teams are busy, the ambulances without a nurse are used.

The dispatchers only sort the calls in order to dispatch the MUG-teams appropriately if necessary. For this purpose, they dispose of a list of indications on which they have to send out a MUG-team.

The MIVA-teams operate under strict standing orders, giving them the opportunity to treat all non life-threatening conditions and specific life-threatening conditions. These standing orders are the result of an agreement made by

the joint medical-nursing staff of the two emergency departments. This agreement is based on evidence based therapeutic orders. The MUG-teams operate under protocols all conceived and updated by the medical staff of the University Hospitals' Emergency Department.

This Leuven system was set up to augment the standard of emergency care as indicated by the Government.

The hospital-based care system was also instituted to counteract the totally insufficient government funding. The highest cost in the Belgian system is the non-value attributing time when a team has to wait for the next call. The Leuven system tries to attribute value to waiting time by using the nurses and doctors in the Emergency Department.

In 2003 the Leuven Emergency Medical Service had about 4500 primary interventions and 1480 MUG interventions. It also performed 660 intensive care transports and 140 neonatal transports for the University Hospitals.

## **SWOT of the Belgian and Leuven system**

### **Strengths**

#### Belgium

The system is manned by highly motivated and professional people with a good background and experience.

A second tier responding with a trained physician to cover all life-threatening conditions and bringing a part of the hospital to the patient.

Thanks to the education of the Belgian public and the existence since 1965 of the specific 100 (112) number for medical and fire help, the dispatch centres receive only limited numbers of false and non appropriate calls.

#### Leuven

A hospital based system that provides:

1. the participants with ample opportunity to training and retention of their necessary skills
2. their waiting times can be value added by using them for colleague supporting tasks within the Emergency Department.
3. all the pre-hospital workers are able to follow the diagnostic and therapeutic path their patients take, giving them the opportunity to use this feed back in the fine tuning of their clinical skills.

The challenging work environment of the University Hospitals' emergency department provides the people of Leuven with rapid implementation of new techniques coming out of the university and hospital research teams.

The overall quality assurance by experts in emergency medical care. The whole chain from call to admittance to a definitive care facility is covered.

An inspiring team from different background (fire department, volunteer organizations, hospitals) that can teach each other different techniques used in other emergency organizations.

### **Weakness**

#### Belgium

The system is a government resourced, regulated and controlled private system with highly insufficient funding. All organizations have to take up secondary money earning tasks to keep the system going.

At the moment there are insufficient well trained physicians available to staff all MUG-teams. The future decrease of doctors coming out of the universities and trained nurses, combined with the insufficient funding and night shift regime, 24 hrs/24 hrs, make the trained professionals seeking new and more profitable horizons.

Since the high involvement of professionals in the system made protocols in the past not necessary neither desirable, there is a big lack of these.

The 100 (112) call and dispatch centres don't have a specific data gathering system to provide the stake holders with necessary performance data. They neither have protocols checking on performance criteria. Thus, the government cannot know nor check what's going on in the EMS.

#### Leuven

All workers have double tasks when filling up their waiting times for EMS by working in the ED. They must be able to free them for their primary EMS task every time an emergency must be answered.

Little time left for training programs.

#### **Opportunities**

A firmly hospital based system is a good base to oversee and control the whole chain of care from call to definitive care.

Hospitals need also to establish good working relations with their patients' providers, namely the GP's.

The hospital based physician brings a part of the hospital to the patient and also supports his colleague GP and other care providers at the scene.

A physician coached team to give all needed and appropriate emergency care on a high quality base.

All protocols can be widely supported and the necessary research can be activated and implemented by the fieldworkers.

#### **Threats**

A good working team, highly professional but with very limited resources are a sitting duck for a take over by other emergency services or government services seeking for a new reason of existence.

If the funding is insufficient and there is no future perspective to balance the books, the private partners being now the pillars of the system, will seek new more rewarding horizons and the emergency medical system will collapse, costing lives.

The funding risks decreasing even more by lack of money and political interest.

There are until now neither data available on the performance of the EMS-chain, nor money to put up a specific and appropriate data gathering system.

#### **Conclusion**

The Leuven system is a highly professional, multi member team that delivers a very high standard of care thanks to the input of all the regional emergency care providers, including the fire service.

The chain of care is assured and supervised by motivated professionals but there is great need for money to continue attracting professionals, keep up skills and develop new protocols that can keep pace with the fast changing scope of problems emergency medical care has to face with.

## **Finland**

### **Ambulance Service in Finland and the city of Vantaa**

#### **Past**

Prehospital emergency medicine evolved in Finland in the early 1970's, when a physician staffed ambulance started its activity in the nation's capital, Helsinki. Until that time, ambulance services mainly had fulfilled a transport function, because the formal training of personnel was quite superficial and no legislation on emergency medical services (EMS) existed. During the decades to follow, a rapid recognition of the role of prehospital emergency care led to intensified education of care providers into basic level emergency medical technicians and advanced level paramedics. Automated external defibrillators became part of the basic equipment first in ambulances and then in fire engines, operated also by non-ambulance personnel in the late 1980's. In the 1990's, physician staffed units appeared in some larger cities, and the first helicopter operated emergency medical service system evolved in 1992. The academic interest in this area of medicine also rapidly grew, with academic dissertations as a result. Presently, prehospital emergency medicine is considered one of the cornerstones of anaesthesiology, because emergency medicine per se is not a medical speciality in Finland and more than 90 % of physicians involved in prehospital care are anaesthesiologists.

#### **Present**

Finland is a vast country, covering an area of 337.000 square kilometres with a population of 5.3 million. The country is divided in some 450 largely independent municipalities, each obliged to supply EMS services for its citizens under the supervision of its primary health care authority. A decree on EMS in 1994 de-

fines a basic and an advanced level. To obtain EMS services, the municipality may contract either with private entrepreneurs or the local fire brigade. In large cities, the fire brigade usually is the EMS provider. Fire fighters receive a uniform education at the national Emergency Services College, qualifying them to provide basic life support. Paramedics employed by the fire departments provide advanced life support as health care professionals. In smaller cities the fire brigade is responsible only for fire and rescue services. Private entrepreneurs take care of ambulance services in these cities and in rural areas. These entrepreneurs staff their units with basic level emergency medical technicians or advanced level paramedics, depending on the contract with the municipality. In sparsely populated municipalities, volunteer fire brigades manned by non-medical personnel respond to fires, and they may also contract with the municipality to act as first responders in medical emergencies without also providing ambulance services.

Each municipality may independently decide which level of medical care is provided by their contracted EMS service, since there are no regulations requiring a certain level. Medical first responder activity is not defined by law, but generally regarded to be under the jurisdiction of primary health care. Defibrillation is not considered a medical act in Finland, and therefore several fire brigades have purchased an AED and assumed first responder activities in medical emergencies, even if they do not provide ambulance services.

A national emergency phone number "112" is in use. This number connects the caller to the closest of 15 dispatch centres. The number is uniformly known throughout the country and meant to be accessed in all emergencies where the assistance of EMS, police or rescue

services is needed. The same person who picks up the phone in the dispatch centre processes the call, evaluates what kind of help is needed and subsequently dispatches the appropriate unit(s). For medical emergencies, a national criteria based dispatch system is used. This system is analogous to commercial dispatch systems but not validated against them.

Computer aided medical dispatch is in use, using the above mentioned protocol. It aims at identifying the patients at highest risk, and categorises the call into one of four categories

1. "A" = life threatening emergency: sudden loss of consciousness, high energy traffic accident etc. Dispatch of closest unit, paramedic unit and physician if available in that EMS
2. "B" = emergency call: Sufficient information available that patient awake and stable, but complaining of high risk symptom such as chest pain. Dispatch of closest unit if faster than paramedic unit, otherwise paramedic only
3. "C" = urgent call; patient stable and no immediate risk but needs evaluation. Dispatch of EMT unit, patient should be reached within 30 min
4. "D" = scheduled non-urgent transport

Transportation of patients is graded according to cause of transport and urgency. A unit on its way to lower priority call may be diverted to a higher priority call if closer. This may also be done during transportation of a non-urgent patient if the transporting unit is the closest to an "A" scene after consultation with the crew.

Times of phone starts ringing in dispatch centre, dispatch, vehicle starts moving, vehicle stops at scene, transportation begins/leaves scene, arrival at hospital, returns to base and end of mission are automatically registered in

the dispatch centre using radio signals. Vehicle positioning using GPS is being implemented. Dispatch and voice communication is using a nation-wide TETRA radio network.

### **City of Vantaa EMS**

The city of Vantaa covers an area of 242 sq km with a population of 182 000. The city has contracted with the fire department for EMS services. The fire department has 3 rescue stations with fire engines responding also to medical emergencies as a first response unit activity. All are equipped with automated external defibrillators. In two of these stations, an ambulance with fire fighter EMTs is also located. The advanced life support level is provided by two paramedic staffed ambulances, physically located at a hospital and an out-patient clinic but employed and administered by the fire department. The third level of care is provided by the Helsinki Area HEMS, which responds to all category "A" calls in the city together with a paramedic unit and ambulance or first response unit. For non-urgent calls, the city has contracted with a private entrepreneur. Those two ambulances are staffed with basic level EMTs, and they respond also to all urgent call if closest to the scene. The Helsinki dispatch centre, taking care of all dispatch for 7 cities in the capital area, is presently responsible also for the city of Vantaa, but a national reorganisation of dispatch centres will hand over the city to another centre next year.

### **Strengths**

The law requires the municipalities to ensure EMS services. Although the municipalities may contract with different providers to obtain this service on a basic and / or advanced level, the population is well covered with at least basic services. The patient is charged a nominal fee. Basic life support is at a good level in all areas,

the crew is young and well motivated. Education of fire fighters at the national Emergency Services College provides a uniform training. The national emergency phone number is well known.

The municipalities have formed 20 geographically larger regions for the provision of specialised health care. Medical directors for EMS services have been appointed in these regions. The role of these directors is to co-ordinate the provision of advanced life support in their respective regions. For example, prehospital thrombolytic therapy for myocardial infarction is largely available throughout the country.

### Opportunities

A closer co-ordination of first responder activities, basic and advanced life support resources in the municipalities and utilisation of the existing four helicopter emergency service systems should result in a more equal opportunity for all citizens to receive appropriate care. This need is accentuated by the closing of smaller hospital and centralisation of hospital and out-patient services during evenings, nights and weekends.

### Weaknesses

Although the municipalities are required to ensure EMS services, there is no compelling legislation regarding the level of care provided or target response times. This has led to wide variations between individual municipalities. Furthermore, the EMS providers are reimbursed both for providing the contracted service as well as for each call. Because of this, there is a financial competition between service providers in neighbouring municipalities, which occasionally has led to difficulties in dispatching the closest or most appropriate unit to a scene. This problem is now being erased.

### Threats

With the centralisation of health services during out-of-hours, there are growing demands on the performance of the EMS systems. Transportation times will increase to a substantial degree, leading to the emptying of resources especially in sparsely populated areas. Patients have to be cared for in the prehospital environment for longer times, which also sets demands on the education of the care providers.

### Conclusions and Future perspectives

Despite long distances and large rural areas, the country is fairly well covered by basic life support services, and advanced life support is being more systematically structured to ensure also advanced level care for those in need of it. Funding of a nation-wide helicopter EMS service system to support local EMS systems is currently being evaluated, with the target of increasing the number of HEMS systems from the existing four to 6 – 7 units. A dedicated group of physicians working in the prehospital environment and assuming the roles of medical directors has evolved during the last decade. Efforts to integrate their knowledge into the emergency department and the care of patients in the emergency area are being considered.

1.	Total annual number of calls to Vantaa Ambulance Service (both EMS and primary care) for 2002-2003:	n.a.
2.	Total annual number of responses for 2003:	16 770
3.	National Dispatch System	



## **FRANCE**

### **SAMU 92 (Service d'Aide Médicale Urgente des Hauts De Seine)**

#### **Past**

SAMU 92 was founded at Raymond Poincaré Hospital in GARCHES, in February 1974, initially responding only to life-threatening cases, until finally the « Centre 15 » was opened, offering the public a national free of charge phone call for Emergency Medical Services : # 15. SAMU operates in the province.

Criss-crossed by a large network of major highways which converge to Paris, the Hauts-de-Seine province borders Paris, and is a crossing point; almost 800,000 people work in the 43,000 companies located in Department of Hauts de Seine with a population of 1.5 million inhabitants. 14 public hospitals and more than 10 private clinics serve the populace.

#### **Present**

From wherever the call originates, SAMU 92 provides a rapid and appropriate answer, for example:

- Giving medical advice and directing the person to the office of the doctor on duty.
- Sending a general practitioner.
- Sending an adequate BLS or a non-medical transport vehicle manned by volunteers.
- Sending a mobile resuscitation unit – ALS (Advanced Life Support).
- Sending an emergency forensic mobile unit, manned by a physician, a nurse and an EMT.

Centralised dispatching is a co-operative activity between Public and Private medicine, based

on the 6th January 1986 law and its Statutory Orders, setting up the SAMU missions and the ability to allow co-operation with private medicine and all health partners.

#### **Emergency calls processing**

##### *Input of a Call*

All emergency calls pass through the Switchboard, run by permanent Auxiliary Medical Dispatchers who are trained on Radio-Communication and telematic techniques.

The call is inputted into a computerized information system. According to the nature of the emergency call, the processing of the call is directed towards a dispatching doctor, who, after brief but very precise questioning, evaluates the severity of the case and provides an adequate response, allocating a specific resource.

2 to 5 physicians dispatch on line: 1 to 3 from private sector for emergency calls and 1 to 2 from public sector for life-threatening emergencies on a daily roster.

##### *Private Sector Dispatching Doctor*

This unit co-ordinates the District Councils' on duty list of general practitioners and ensures that the private sector doctors participate in the management of the district emergencies.

More than 60% of emergency calls are processed by allocating a general practitioner or giving on-line medical advice.

### Public Sector Dispatching Doctor

Severe and immediately life-threatening calls are managed by a Public Sector dispatching doctor belonging to the SAMU 92 (Anaesthesiologist or Emergency physician).

These calls, in general, need the response of a Mobile Resuscitation Unit

### First Aid Dispatchers

The First Aid resources group, comprising private ambulance companies (non-medical ambulances) in the area, and voluntary organisations such as the Red Cross and Civil Defence, work together.

The First Aid dispatcher allocates the correct resource for transportation and monitors their follow up. This unit is responded in non life-threatening emergencies.

These different units share the same computerized information system, allowing each of them to work with their specific processing, but sharing the same information.

Telemedicine tools help the doctors to choose the appropriate resource, in term of quality and cost, allocating the medically trained mobile units when facing life-threatening emergencies, private general practitioners when home treatment is needed, and non-medically trained transportation for minor and routine emergencies.

### **The Resources**

In order to provide the appropriate response, the following resources are deployable:

### BLS Resources

#### **1. Fire**

SAMU-Centre 15 is directly connected by its Switchboard to the Fire Staff Headquarters. This closed connection allows an intervention within 10 minutes. If required, the dispatching doctor can request a resource to provide BLS, or extrication in the case of road accidents.

#### **2. Police**

Very few emergency calls pass through this service. These calls are retransmitted by direct line to the dispatching doctor of SAMU-Centre 15. The Police mission is to protect persons and properties, to report an accident, to mark out and beacon the accident area, and to supply a motorcycle escort if necessary.

#### **3. Red Cross and Civil Defence**

Volunteer structures provide an efficient source of assistance to SAMU-Centre 15 by supplying emergency units to work on the scene during rush hours and busy periods, especially at weekends and holidays, and a dispatcher who helps at the SAMU CENTRE-15. They run special vehicles which can be medicalized if required (disasters, mass demonstrations, protection).

#### **4. Private Ambulances**

The large private non-medical ambulance companies put at the disposal of SAMU-Centre 15 emergency non-medical units (6 during the day and 3 at night), and a dispatcher who is in charge of their co-ordination.

### **Home Care and Social Emergencies**

As a result of the ageing population, disabled persons and the wish to stay at home in the family environment, there is a move towards an integrated home care service, with remote

alarm systems, based in SAMU. Dedicated social workers answer these calls, sharing the same premises and information system as SAMU.

### Worldwide Repatriations

SAMU 92 provides medical and paramedic escorts in partnership with Assistance and Insurance companies.

### Training and Teaching EMS

Life-threatening cases need immediate life-saving intervention and treatment, which can only be provided if all the partners involved in pre-hospital care are well trained; teaching and training in emergency medicine are primary missions for the SAMU.

Teaching and training are carried out in an Emergency Care Teaching Centre (CESU), which is open to all those involved in emergency care, including:

- Doctors: training of residents and interns as part of general medicine training, post-graduate programmes for general practitioners and occupational doctors
- Health personnel: Training of ambulance drivers Emergency training SMUR training
- Training of volunteers: First aid workers from the Red Cross, civil defence
- Foreign trainees: Co-operation with foreign countries assists SAMU in setting up emergency structures, as a part of cooperation mission.

### The Near Future, Strengths and Weaknesses

The population is increasingly turning to emergency departments, whatever their health status and needs. SAMU 92 will increasingly take on the role of the 'gate keeper' in checking and regulating the access to the emergency care system and emergency departments, by the best use of all available resources, including those of the private and public sector.

Home care, telemedicine tools with transmission of medical information and enhanced prioritisation dispatch systems will help in maintaining a high standard of care, in the climate of an ageing population and increasing demands for medical care.

The current French EMS system allows day only two types of transportation resources: Non Medic, or Medic. In the very near future, nurses will have the capability to staff ambulances, increasing the available resources with the aims of generating the most appropriate response and cost-effectiveness.

1.	Total annual number of calls providing an medical answer (either medical advice, either resource sent):	144 609
2.	Total annual number of ALS resources	12 567
3.	Total number of BLSresources	36 931
4.	Total number of medical advices	82 010

from January 1st 2003 to December 31st 2003 SAMU 92

## **Germany**

### **City of Bonn - Fire Department**

### **University of Bonn – Department of Anaesthesiology and Intensive Care Medicine**

### **Hospital Bad Godesberg - Department of Anaesthesiology and Intensive Care Medicine**

#### **Past**

Ambulance service in Germany – as in many other countries - developed on a local basis and was typically depended on different voluntary organisations (German Red Cross, St. John and others). Specialised EMS legislation were gradually introduced in the different states of the Federal Republic of Germany during the 1980ies. After reunification, the new states on the territory of the former German Democratic Republic followed this model abandoning the concept of the Schnelle Medizinische Hilfe as an integrated part of health care provision.

Because of the historical development the voluntary organisations are still the dominant providers of EMS Services. Mainly in larger cities, the professional fire brigades are also providing EMS.

#### **Present**

EMS authorities are expected to organise their services in accordance to the state's recommendations. For North Rhine-Westphalia there is a recommended response time. Currently, any emergency patients should be reached within eight minutes in urban areas and within twelve minutes in rural areas (in 90% of all emergency calls) by the first EMS unit responding to the scene.

Counties or cities are responsible for the cost effectiveness of their EMS system including dispatch centres. EMS is financed through user

fees which are charged to the Statutory Health Insurances or for privately insured patients directly to the user. EMS user are fees are based on budgets prospectively negotiated between the local EMS authorities and the Statutory Health Insurance Companies.

In Bonn, EMS, including dispatch is organised and provided by the fire brigade. EMS follows a so called rendezvous system with ALS units and emergency physicians (EP) responding and separate vehicles to an emergency scene. In 2004, there were 4 ALS and 2 EP stations and 11 hospitals within the service area. The non-emergency transports were purchased from non-profit private organisations.

Emergency ambulances are staffed with one Rettungssanitäter (EMT) and one Rettungsassistent (Paramedic). The EPs are provided by the Departments of Anaesthesiology and Intensive Care Medicine of the University Bonn and the Waldkrankenhaus in Bad Godesberg. The Medical Director's office is linked to the fire brigade. The Medical Director is in charge of medical oversight and quality control and plays an important role for any decision regarding EMS system design.

#### **Strengths**

The EMS system in Bonn has a long term record of continuous documentation and monitoring, the provision of emergency medical care within its service area. This data base is an important source for EMS related research which is continuously undertaken with the university of Bonn and other national and international research partners. Due to comparatively short response times and higher level of emergency physician and paramedic skills, the Bonn EMS system has scored high in comparative outcome studies.

### **Opportunities**

EMS dispatch centres have the potential to play an important role as gate keeper to the health care system. Therefore, emergency dispatch has to be developed in co-operation with health care providers from pre-hospital, out-of-hospital and hospital care providers into an integrated medical health centre filtering medical needs and providing adequate medical response.

### **Weaknesses**

System design, economic efficiency and use of state of the art information technology for dispatching and communication has been neglected by most EMS systems in Germany. This is partly due to fragmentation of legal, organisational and financial responsibilities. In areas where dispatch of EMS and fire fighters is linked in one common dispatch centre the different needs and approaches of EMS and fire fighting is often creating further obstacles to an optimisation of EMS dispatch.

### **Conclusions for the Future**

The financial pressure in the health system will increase the requirements for higher efficiency in organising and providing EMS service and for a stronger focus on the actual medical need of patients.

There is the need for implementation of medical prioritisation systems, of larger dispatch areas and of modern technological skills.

## **Italy**

### **Servizio 118 Genova Soccorso**

#### **Azienda Ospedale San Martino Genova**

In this document we will briefly analyze the Emergency Medical Services system management in the whole Italian territory

#### **Past**

Till 1992 emergency medical services in Italy were performed by volunteers associations or public hospitals that managed by themselves medical emergencies on their territorial jurisdiction.

Some regions of the northern Italy started to organize emergency medical services on their jurisdictional areas, driving the public attention to the need of a national effort to optimize the service.

On March 27<sup>th</sup>,1992 a Government law put the bases for the medical emergencies managed by territorial dispatch centers, indentifying tools and personnel skills to run the system.

#### **Present**

The activity of the emergency medical service in Italy is exclusive competence of the national health service,118 is the phone number for medical emergency in Italy

Since the law of march 27<sup>th</sup>, 1992 EMS management is run by the National Health Service (in particular the Regional Government's health management which respond to the Ministry of health on a partial auto-management basis, federalism)

in a three-stage manner:

ALERT (DISPATCH CENTER)

TERRITORIAL MANAGEMENT SYSTEM (AMBULANCES, ALS CARS, HELI EMS)

EMERGENCY HOSPITAL AND FIRST AID POINTS NETWORK

#### **Dispatch Centre**

Dispatch centers (DC) gathers all the informations regarding medical emergencies, usually covering a town County area (Provincia), receiving the emergency calls from population in distress. Personnell in DC manage and coordinate medical emergency resources according to the kind and the priority presumed of the emergency arisen. DC holds radio/cellular/data connections with emergency units and hospitals/ER involved in the system.

As said before the population served by a single Dispatch Center belongs to the entire County area of a main town. In some region, according to particular geographical specifics (extensive country/rural areas) are served by more Dispatch centers in the same County always working in continuos liaison.

Personnel manning Dispatch Centers are

- 1) Medical Doctors trained in emergency management
- 2) Nurses with experience in hospital's critical areas
- 3) Telephone operators (dispatchers) to receive emergency calls.

Phone calls reporting medical emergencies are processed through the Dispatch Medical Priority aid and response is managed through dispatching of appropriates units, staffed and equipped according to the need.

Operator receiving the call in the DC process the request, assigning a coloured priority code (green, yellow, red) according to the description of the pathology and/or the event ongoing.

Obviously priority codes can be modified on the way after the situation is assessed by emergency mobile unit staff. Upon arrival in the hospital priority code is reviewed by hospital personnel after arrival triage and visit (usually code is unchanged from the first triaging to hospital arrival).

Medical Emergency Dispatch Center works in close liaison with other public structures managing emergencies (Fire brigade, Police, Carabinieri).



118 Genova Soccorso – Dispatch Center

### **Genova Soccorso Medical Emergency Dispatch Center**

Every 6 hours Dispatch Center gather bed units availability from hospitals' critical areas and in some cases normal hospital divisions (especially regarding the actual receiving capability), using informations to balance patient transportations according to pathology and priority, some EMS DC manage transplant transport operations and blood supply. Main Regional EMS DC is also in charge for disaster management.

### **Territorial Management System (Ambulances, ALS Cars, Heli EMS)**

As we said before appropriate emergency units are dispatched according to the single pathology/priority.

Units are of different kinds, according to the territory in which the single system operates:

### **Medical Ambulance (ALS)**

Emergency Physician, Nurse and 2 EMT staff an appropriately equipped ambulance going on emergency stabilizing the patient on scene and transporting him to the closest and qualified hospital, according to DC suggestions.



The advantage is found in the good and continuous assistance of the patient by qualified personnel, Disadvantage is the impossibility by ALS medical staff to leave the patient when their patient assessment reveals a lower priority – less important pathology than the one previously assigned by DC triage.



Medical ambulance – equipment

### **ALS Cars**

Emergency Physician, Nurse and one EMT-Driver staff an appropriately equipped car which cannot be used to transport the patient.

Advantage is in the fast moving and flexibility of this unit and its ALS staff who can be dis-

patched from one emergency to another not being tied up to patient's transportation. Disadvantage is the impossibility by the unit itself to carry the patient and the needed to wait for a BLS ambulance to do the transport, extending the range of time between first alarm and arrival in the hospital.



ALS CAR "GOLF 1" 118 GENOVA SOCCORSO

(All the EMS DC operating in the region use this kind of unit)

### **Helicopter EMS (HEMS)**

Emergency Physician and Nurse are on board an Helicopter with flight pilot and technical rescuers staff.

Advantage are the high mobility of the unit and the possibility of intervention and transport without interrupting the continuous assistance to the patient.

Disadvantage are the low use of this kind of means (normally in country/mountain area only), the flying possibility reduced to daytime and good weather conditions only, the high costs of this operations

In our region the heli belongs to the fire department who support maintenance and operative costs, EMS provide Emergency Physician, Nurse and medical equipment.



Helicopter AB 412 Fire Brigade of Genova, in use of Genova 118 EMS

### **BLS, ALS-D Ambulance**

Our region's government made the choice to use ambulances of volunteer associations (Red Cross and National Association of Public Assistance), instructing volunteer personnel through regional courses in basic medical emergency. An increasing number of volunteer operators are trained to the ED procedures.

In other regions professional personnel or a mixture of both professional and volunteer are used.

Advantage of the volunteers based system is the capillary territorial distribution of emergency resources, in both down town and rural areas.

Disadvantage is in the poor knowledge of medical emergency procedures from the volunteer personnel.





Ambulance - volunteer association

### **Emergency Hospital and first aid points network**

In each region, based on geographic, inhabitants tissue, and road conditions are identified jurisdictional area manned by Hospital's emergency departments and other structure as specified below:

#### **Hospital with basic emergency facilities**

They guarantee basic medical assistance, diagnosis and therapy, stabilizing and monitoring the patient, to be transferred in a appropriate equipped hospital when feasible and if needed

#### **Emergency department 1<sup>st</sup> level**

They provide 24h intermediate medical assistance, hosting multi-speciality divisions, labs and radiology units.

#### **Emergency department 2<sup>nd</sup> level**

Holds full trauma and medical capability, providing high speciality care and divisions (neuro-surgery, cardiac-surgery, thorax-surgery, intensive care, coronary unit). This kind of structure coordinates and train the other medical emergency structures of the region.

#### **Medical data transmission**

Thanks to the development of transmission and electronic technology, emergency medical

services in our region uses medical data transmission technology.

Said as informatic sciences to be used for transmitting bio-medical datas, this important tool is used from some years in countries like USA, Canada, Australia.

The advantages are mainly in the possibility to transmit ecg's in all those cases where a cardiac ischemia is suspected by Als unit on scene. This allows the team, in case the pathology is confirmed, to early-start re-perfusion therapy.

#### **Conclusions**

This quite new territorial medical emergency management system is a good improvement of the assistance quality in distress situations provided to the population.

Before implementing this system, medical emergencies were managed on a "scoop and run" basis: the patient was loaded on the ambulance and fast-carried to the nearest hospital, regardless to the real treatment capability of the hospital itself.

Today thanks to this system that allows the "stay and play" procedures, the patient is stabilized on scene and then transported to the more appropriated hospital in the area.

- Total annual no. of calls : 94679
- Total annual no. of responses: 77431
- Dispatch system: advanced medical priority dispatch system

## **Norway**

### **Ambulance department Ulleval University Hospital**

#### **Past**

In June 2001 the Norwegian Storting (parliament) resolved that central government should take over responsibility for all public hospitals including the ambulance and EMS service. The hospitals are to be operated as *health enterprises* and they are from 1. jan. 2002 wholly owned by the central government.

This reform forms part of the government's objective of modernizing the public sector. The reform is based on the basic values of the welfare state: equality, justice and solidarity.

The two tenets of the reform are that:

- Ownership of the hospitals will be transferred to the central government sector, thereby placing responsibility with one owner.
- The hospitals are to be organized as enterprises. This means that they will become separate legal subjects and will thus not be an integral part of the central government administration. Principal health policy objectives and frameworks will be determined by central government and will form the basis for management of the enterprises.

Even though this reform is often called a hospital reform, it also includes most county municipal specialist health services – within both somatic and psychiatric health care and the ambulance service.

Norway has 85 hospitals for its 4.5 million inhabitants. In all, approximately 350 institutions in the central government specialist health service – including psychiatric institu-

tions, the ambulance service etc. – will be transferred to the central government sector.

The hospitals are organised as health enterprises divided in five regional health enterprises, which in turn has been established to organise the hospitals under around 50 health enterprises.

An increasing amount of public resources are spent on the health sector. Each year Norway spends NOK 50 billion NOK on hospitals, making it *one* of the European countries – and *the* Nordic country – with the highest level of public spending on the health service per capita.

The ambulance service in Norway is normally organised under the hospitals providing the emergency care for the county (Norway has 19 counties). In Oslo, Ulleval University Hospital provides the service to both Oslo and Akershus county's. The service is Norway's largest service providing care to approx. ¼ of the inhabitants of Norway.

#### **Present**

The ambulance services in Norway vary in size and workload, from the larger urban ambulance services such as Oslo and Akershus, to small rural services in the northern and western parts of Norway and the coastal line. Some services cover very large geographical areas with small populations, 500 to 1000 inhabitants, and with long distances to the nearest hospital, 400 km or more.

The ambulance services at Ulleval has created medical and operational guidelines which now covers most of the services through out the country. The Norwegian Medical Association has in collaboration with the Laerdal foundation developed the Norwegian Medical Index used for prioritising in almost every the medical dispatch central trough out the country.

The ambulance services have mixed provisions of doctors, paramedics, technicians, and operate roadambulances, ambulanceboats, helicopters and aircrafts and cooperate closely with the rescue service when in need for more heavy equipment

There are no legislation or centrally set targets for the service currently. Each service operate after their own standards where very few are evidence based.

The Norwegian ambulance services currently provide a mixture of emergency and urgent care, support for General Practitioners and patient transport. The Ambulance service at Ullevål currently handles in excess of 400 emergency calls each day.

There has almost been a doubling of ambulance service demand in Norway over a 10-year period. As for the rest of the developed world there is an inexorable rise in demand. The reasons for this change are not fully understood.

Ullevål Hospital has set some goals for its ambulance service:

1. That the sickest should be treated first.
2. That definitive care should be delivered in a minimum time.
3. That the baton of care should be provided at the lowest effective level of care as possible with the right level quality.
4. That resources should be maximised in terms of utilisation, manpower and skills.

The challenges for the Norwegian ambulance services are to meet the rise in demand and to develop systems for bringing together all demands for unscheduled care, including emergencies, requests from family practitioners for urgent admission and management of enquiries from the public combined with a lack of funding.

With an ageing population, increasing expectation through new legislation and political focus on service delivery, the gate-keeping role for ambulance services is likely to become more challenging. The use of prioritising- and triage systems will likely not be enough to avoid a huge rise in workload in the service.

In Norway the out-of-hours general practice organise their services in larger and larger areas putting more workload on the ambulance service. This results in an increasing demand for more and longer transports, higher levels of care and a wider range of services provided by the paramedics and EMT's. This requires further education and demands for a more competent service, especially out in the rural areas.

New knowledge, new technology, pharmacology and new ways of treatments puts new and challenging demands on the service. 12-lead ECG, thrombolysis and gateways to PCI is just the start for a dramatic change in demands for a new standard in EMS. This will require a new way of educating and recruiting employees for the future. Lack of competent staff is and will be an increasing challenge for the next decade.

### **Strengths**

The Norwegian ambulance services are provided by elected hospitals in five regions. This gives a unique possibility to see the service as

part of a chain of treatment from the local GP's through EMS-service to the hospitals providing a range of demand driven response.

The services are 60% manned by EMT's with a four national certified education. A national Paramedic (One year full time in addition to EMT) education on University level gives the service a unique and leading role of providing excellent care in a changing and more demanding society. This is driving development in the direction towards a unified standard for pre-hospital emergency care in Norway.

The provision of the Ullevål medical and operational manual and uniform medical guidelines for telephone advisory triage has been a major step forward for the service.

Ambulance services have well-motivated workforce, who are keen to adopt new professional roles and have recently been awarded professional status within the healthcare legislation, elevating them from stretcher carriers to clinicians.

In recent years, ambulance services have started to appoint Medical Directors, who come from mainly the anaesthesia departments in the responsible hospitals.

Ambulance services have adopted new treatment techniques and technology with enthusiasm, particularly in the management of coronary patients and patients with severe trauma.

### **Opportunities**

As public demand for emergency care and unscheduled care rises, ambulance services have an opportunity to develop as providers of integrated care, bringing together primary care, acute care and out-of-hours advice services.

By extending the education and skills of paramedics and providing new educational opportunities, many of the roles currently undertaken by General Practitioners could, if appropriately funded and resourced, be devolved to the paramedics in Norway.

Reorganisation of hospital and primary care services provides an opportunity for ambulance services to participate in major system change, in order to improve the integration of care.

New technologies may, in the future, allow the development of the electronic clinical record, and improved clinical governance.

Demands for cost efficient hospitals gives the EMS service an unique possibility to prove their ability of logistics, bringing the right patient to the right level of care first time, with the right level of care and quality with in a reasonable cost.

### **Weaknesses**

The ambulance services in Norway are currently in many areas of Norway on the margins of clinical care.

The geographical demands are great challenge to provide the necessary service with in a reasonable time and cost.

There is a lack of funding and organisational awareness in the hospitals, for the change in demands in the EMS service. There is not enough competence throughout the country to organise and provide a modern cost efficient service in line with the increasing demands.

The growth in demand and new treatment and technology, will result in a unsolved need for competent staff. The school system and the

EMS-providers, has not been prepared for this challenge and the funding system is not prepared for this demand.

### Threats

The primary threat to the delivery of effective emergency care in Norway is the ever-increasing workload of cases which present in an undifferentiated manner.

There is an urgent need to focus on the delivery of emergency care and to integrate all types of emergency systems together, including those generated by General Practitioners, to develop a better chain of care where patient can be treated at the lowest level of care.

For the future, further research into emergency and unscheduled care needs to be carried out to expand the evidence base and to ensure that paramedic performance, treatment and outcome is monitored and audited.

There is an expectation that the role of paramedics and ambulance services can expand to replace absent out-of-hours general practice. This is not a sustainable objective without an increase in paramedic numbers and a significant change in their skills and training.

Lack of funding and lack of competence is the two greatest threats to the service.

### Summary

The growth in demand and a more specialised healthcare system, has increased the demands on ambulance and emergency services. The service is suffering from a lack of funding due to this change

New technology and new ways of providing care for the ill and injured patients, gives the service a window of opportunity to reform the

ambulance. The new organisational structure of the health care, gives the a unique possibility to see the EMS service as a integrated part of the healthcare system.

Extension of EMS skills requires investment in training and technology.

### Conclusions for the Future

Until the role of emergency medical services is clearly defined and resourced, the tide of rising demand created by increased public expectation, ageing populations and medical advance threatens the ability to deliver effective emergency services.

Funding, enough educated staff and new organisational solutions, will be the three major challenges for the future.

1.	Total annual number of calls to Ullevål University Hospital ambulance service 2003, (Akershus county only)	53000
2.	Total annual number of ambulance service responses for 2003: (Akershus county only)	36940
3.	Prioritisation by The Medical Index for Norway	

## **Spain**

### **Servicio De Urgencias 061, Cantabria, Spain**

#### **Past**

The National health Institute was established in 1963, but until 1987 there were not professional services. That year two EMS (Emergency Medical Services) services began their activities, unfortunately the area and the population they covered were small compared to the whole country.

Most of the territory, ambulances were provided by volunteers of the Red Cross or other voluntary organizations.

In the early nineties the EMS became professional services, first in Madrid and Barcelona and at the end of the decade the whole territory of Spain was covered.

#### **Present**

Spain is divided in 17 autonomous regions, each one has its own regional health service, that must Emergency Medical Services.

There are 21 services in Spain, one in any of the 17 autonomies, one in the cities of Ceuta and Melilla and two more in the large cities of Madrid and Barcelona.

There are big differences in the area and population covered. Some services like Madrid is a high density area and others services like Castilla-Leon must provide care in a huge area with a very low density of population.

Each service set its own standards of care and the guidelines generally are local.

The SEMES ( Spanish Association of Emergency Medicine) has a task force on QI in EMS and hospital ER.

There are two types of ambulances , a basic level with a crew of one or two EMTs, most of the time their training is low and the equipment that the vehicle carries is very basic.

Some services are improving the training of their EMTs and equipping all the basic ambulances with Automated External Defibrillator, but there are not national standards.

The Advanced level units crew is a physician, a nurse and two EMTs.

Most of the physicians are GP or family doctors with a special training in emergency medicine, there are also a small number of anesthesiologists, internal medicine and critical care specialists .

The majority of the nurses that works in the ambulance service have a previous experience of working in ER or critical care units.

There no a specialty in emergency medicine or nursing, but the SEMES is demanding it to the Ministry of Health.

Certain services has a great support in the GPs in the very rural areas.

Some services provide interhospital transport of critical patients and scheduled transport of patients.

Each service has its own prioritization system.

One of the main task of the dispatch centers is the medical advice that the physicians provide. The calls demanding this information is increasing every year. And the dispatch center acts a gate-keeper.

#### **Strengths**

The EMS are provided by the Regional Health Services, closer to the citizens demands than the National Ministry of Health.

The services are young some of them has less than five years of life and the workforce is very enthusiastic.

Each service has a medical director.

The dispatch centers have right size for managing the number of calls received and in all of them are always physicians present.

The dispatch centers act as gate-keeper in the access of the population to the health system, reducing the demand to the GP offices and the ERs.

### **Opportunities**

The public demand of emergency care rises every year, EMS have the opportunity of been part of an global approach to the emergency demand

together with primary care and the hospital ERs, sharing professionals and guidelines in a efficiency manner and with the population served as the main objective.

In Spain the role of EMTs, and nurses at this moment are not well defined, a lot of physician resources are used in many cases that a lower level of care provided by well trained EMTs and nurses could be enough.

The specialty of emergency medicine and nursing is necessary and a

National standardized education for EMTs.

New treatments and technologies that a few years ago were exclusively used in hospital can now be applied and used in the prehospital setting.

A National or even European dispatch prioritization system would be developed.

The challenge is to can affront the rising demand in a cost effective manner, redefining the role of the professionals involve in the emergency care.

### **Weaknesses**

Some services are still growing and need to be developed in the whole areas they assist.

We have good staffed and trained ALS but on the other hand they can not arrive to all the population and the BLS level is poor trained an equipped, and in the middle nothing.

Some services has adopt the European Emergency number 112 and others still use the National medical emergency number 061.

Lack of unified prioritization system

National protocols, guidelines and standards need to be developed in order to give the population the right response.

### **Treats**

Proper resources and personal need to be assigned to the services otherwise they could not afford the increasing demand.

EMS need to define their role in the whole emergency care system otherwise they could be relegated to be just transport agencies.

### **Summary**

The demand in the dispatch centers increases every year and the cost too, a efficient response must be delivered. The skills of all the professionals (physicians, nurses and EMTs ) involved in the emergency care must be re-define, otherwise this services we could not afford the demand in a cost effective manner.

Further research evidence based is need to support treatments and outcomes .

The use of new technologies will be very important tool both for the dispatch centers and the units, for example, electronic records or transmission of information between levels of care.

Prioritization systems need to be developed to give the right respond to the needs of the population.

The ageing of the population will generate new challenges for the EMS.



## **United Kingdom**

### **West Midlands Ambulance Service, Birmingham**

#### **Past**

The British National Health Service was established in 1948 as a unified, integrated health service. However, until 1974, ambulance services were organised by the local authorities, in a variety of ways.

Prior to the inception of the National Health Service in 1948, ambulance services had been organised throughout two world wars in a haphazard fashion.

Many employers provided ambulance services for their employees and many other ambulance services were provided by voluntary organisations, including the Red Cross and St John Ambulance.

Since 1974, the National Health Service has been responsible for ambulance provision, initially at a basic emergency life support level, with a gradual evolution through basic life support without the provision of defibrillation and in 1980, the first paramedics providing advanced life support commenced work in the large cities of the United Kingdom.

The training of these paramedics was centrally organised but of variable standard.

#### **Present**

Ambulance services in the United Kingdom are currently provided by the National Health Service.

The 32 ambulance services in the United Kingdom vary in size and workload, from the large urban ambulance services such as London Ambulance Service and West Midlands Ambu-

lance Service, to small rural services in the Shire counties such as Warwickshire.

Some services cover very large geographical areas with small populations, such as Scotland and Wales.

The ambulance services for the last 18 months have been treating patients using the Joint Royal Colleges Ambulance Liaison Committee guidelines for United Kingdom ambulance services, the first time a national standard of care has been set for ambulance services.

In 2001, United Kingdom ambulance services attended 15 million patients.

The services have mixed provisions of paramedics, technicians, ambulances and solo responders.

Targets are set centrally and are not currently evidence based.

The United Kingdom ambulance services currently provide a mixture of emergency and urgent care, support for General Practitioners and patient transport. West Midlands Ambulance Service currently handles in excess of 1100 emergency calls each day.

There has been a doubling of ambulance service demand in the United Kingdom over a 10-year period.

There is an inexorable rise in demand, the reasons for this change are not fully understood.

The majority of United Kingdom ambulance services use AMPDS (Advanced Medical Prioritisation Dispatching System) as the prioritisation system. The future for ambulance ser-

vices in the United Kingdom was defined as part of the Reforming Emergency Care initiative, published by the Department of Health in London in October 2001.

Reforming Emergency Care recognised the need for an integrated triage system used by the whole NHS and summarised the objectives of Reforming Emergency Care as follows:

1. That the sickest should be treated first.
2. That definitive care should be delivered in minimum time.
3. That the baton of care should not be passed unnecessarily.
4. That resources should be maximised in terms of utilisation, manpower and skills.

The challenges for the UK ambulance services are to meet the rise in demand and to develop systems for bringing together all demands for unscheduled care, including emergencies, requests from family practitioners for urgent admission and management of enquiries from the public.

In the United Kingdom, the role of the General Practitioner is fundamentally changing, the Government has established National Health Service Direct as an advice line and gate-keeper and ambulance services are being asked to focus primarily on emergency care in life-threatening emergencies.

In the light of ever-increasing demand, the challenge for the future is to ensure the limited ambulance resources are focused on patients who are at immediate life-threatening risk and

arrangements need to be made to ensure that the baton of care is passed appropriately to other providers in non-emergency, unscheduled care situations.

As the population ages and access to out-of-hours general practice becomes more selective and restricted, the challenge for ambulance services is to respond in a similar manner.

Ambulance services are becoming heavily dependent on computerised prioritisation and streaming systems.

With an ageing population and increasing expectation, the gate-keeping role for ambulance services is likely to become more challenging and the focusing of emergency resources on immediate life-threatening problems will become a greater priority.

### **Strengths**

United Kingdom ambulance services are provided by the National Health Service and, as such, are adequately resourced.

The services are 80% manned by paramedics and there is now a unified standard for pre-hospital emergency care beginning to emerge.

The provision of the Joint Royal College Ambulance Liaison Committee guidelines for the United Kingdom has been a major step forward.

Ambulance services have a young and well-motivated workforce, who are keen to adopt new professional roles and have recently been awarded professional status within the NHS, elevating them from stretcher carriers to clinicians.

In recent years, ambulance services have started to appoint Medical Directors, who come from a variety of backgrounds.

Ambulance services have adopted new treatment techniques and technology with enthusiasm, particularly in the management of coronary patients and patients with severe trauma.

Being part of a National Health Service, there is a close cross-border working relationship in a supportive manner between ambulance services, both for routine and mass casualty situations.

### **Opportunities**

As public demand for emergency care and unscheduled care rises, ambulance services have an opportunity to develop as providers of integrated care, bringing together primary care, acute care and out-of-hours advice services.

By extending the education and skills of paramedics and providing new educational opportunities, many of the roles currently undertaken by General Practitioners could, if appropriately funded and resourced, be devolved to the paramedics in the United Kingdom.

Reorganisation of hospital and primary care services provides an opportunity for ambulance services to participate in major system change, in order to improve the integration of care.

New technologies may, in the future, allow the development of the electronic clinical record, and improved clinical governance.

Ambulance services have the opportunity to considerably improve patient care and safety by adopting the principles espoused by the

Commission for Health Audit and Inspection, and the national guidelines laid out by the National Institute for Clinical Excellence.

Ambulance services have been early adopters of patient safety through the National Patient Safety Agency.

### **Weaknesses**

United Kingdom ambulance services are currently on the margins of clinical care, only recently becoming recognised as major participants in the delivery of pre-hospital care by skilled clinicians. This problem has been partly internally generated within the services themselves, which have in some areas been slow to evolve from para-military services to clinical services.

There is a lack of perception in the caring community, and at governmental level, of the pivotal importance of unscheduled care. The principal weakness in the United Kingdom ambulance service, and indeed health services, is a lack of a unified prioritisation system, subscribed to and supported by all participants in care. The current systems in place lack sensitivity and specificity in the role to which they are being put in the United Kingdom.

The need to adopt an appropriate unified system is paramount and the need to ensure that the most appropriate resources are used in an effective way, is a challenge for the future.

Protocols and guidelines need to be developed urgently in order to prevent unnecessary responses.

### **Threats**

The primary threat to the delivery of effective emergency care in the United Kingdom is the

ever-increasing workload of cases which present in an undifferentiated manner.

There is an urgent need to focus on the delivery of emergency care and to integrate all types of emergency call for medical assistance together, including those generated by General Practitioners and helplines.

As the NHS responds to the European Working Time Directive and an ageing population, there is an urgent need to reconfigure the third stage of the emergency care pathway, the Emergency Department.

In order to achieve minimum time to definitive treatment 24 hours a day, the number of hospitals may need to be rationalised to provide appropriately staffed and resourced portals of entry to the ambulance service.

For the future, further research into emergency and unscheduled care needs to be carried out to expand the evidence base and to ensure that paramedic performance, treatment and outcome is monitored and audited.

There is an expectation that the role of paramedics and ambulance services can expand to replace absent out-of-hours general practice. This is not a sustainable objective without an increase in paramedic numbers and a significant change in their skills and training.

The ability of emergency services to respond is continually threatened by increasing traffic density and delayed access to hospitals and traffic calming measures.

Unless ambulance services achieve full recognition as integrated emergency care providers, there is a risk that they may become very small units in a large NHS.

For the future, there is a need to integrate ambulance services in to larger business units, functioning as part of the local care system, bringing together out-of-hours advice lines, ambulance and emergency services, general practice and acute hospitals.

### **Summary**

As the demands on ambulance and emergency services have increased and an efficient response has been delivered, there is a trend for other partners in the healthcare system to devolve their role and responsibilities towards the EMS in an unplanned way, thus detracting from the primary responsibility to deliver care to those who are at immediate risk.

A window of opportunity exists to reform ambulance services if the Government Reforming Emergency Care agenda is successful.

Extension of EMS skills requires investment in training and technology.

Single prioritisation systems for system-wide use in the health environment are essential.

### **Conclusions for the Future**

Until the role of emergency medical services is clearly defined and resourced, the tide of rising demand created by increased public expectation, ageing populations and medical advance threatens the ability to deliver effective emergency services in the UK.

The urgent development of a single prioritisation system, a re-definition of the EMS role in the minds of the Health Service and the public, and the extension of paramedic clinician skills by further training, is the way ahead for the future.

1.	Total annual number of calls to West Midlands Ambulance Service (both EMS and primary care) for 2002-2003:	303,124
2.	Total annual number of ambulance service responses for 2002-2003:	309,600
3.	Prioritisation by AMPDS version 11 with effect from 1 <sup>st</sup> November 2003	

**United States of America**  
**Richmond Ambulance Authority**

**Past**

Prior to 1991, ambulance services in Richmond, Virginia were provided by a combination of volunteer rescue squads and private ambulance companies. There were no system standards for response times or patient care, significant portions of the community were underserved, and frequent failures of private ambulance firms caused notable disruptions in ambulance services.

In 1990 city officials explored a number of EMS system designs before deciding to implement a modified public utility model. This model is built upon a public-private partnership designed to ensure equal EMS access to all citizens, as well as adherence to stringent quality and performance standards. The State of Virginia enacted legislation allowing the City of Richmond to form an ambulance "authority", then the City granted exclusive franchise for emergency and non-emergency ambulance services to the authority. Originally labeled Richmond Ambulance Services, Inc. (RASI), the system eventually became the Richmond Ambulance Authority (RAA).

**Present**

The Authority is governed by a Board of Directors appointed by the Mayor and City Council of Richmond. Classified as a not-for-profit governmental agency, RAA periodically holds a competitive bid process to hire a private contractor for managing day-to-day field and dispatch operations. The Richmond Ambulance Authority receives requests for service through a universal 3-digit emergency number ("911"), and distributes an additional 7-digit number specifically for hospital and nursing home non-emergency requests. The Authority

has a fleet of 26 ambulances, 2 supervisor vehicles, and 1 command vehicle.

RAA mandates and monitors strict response time standards for all priorities of calls, measured equally and in aggregate in four "service zones" established within Richmond. For example, Priority 1 requests (presumed life-threatening) require a transport capable ALS (advanced life support) ambulance to arrive on scene within 8 minutes and 59 seconds of the request, with a 90% reliability (9 out of 10 times). Financial penalties exist for late responses, and financial incentives exist for superior response time performance and superior equipment/fleet maintenance practices.

The Authority utilizes a computer aided dispatch (CAD) system and a customized version of the Advanced Medical Priority Dispatch System (AMPDS) for prioritizing EMS responses. In addition, the 911 intake system shows the address associated with the telephone used in calling for help, and spatially represents the location address on a computer map. If the request was generated by cell phone, the system provides an approximate position for the request through locator technology mandated for cell service providers by the federal government.

Each ambulance is staffed with at least one paramedic and one EMT-Basic, and performs at the ALS (advanced life support) level. Paramedics are authorized to use advanced medical protocols and standing orders issued by RAA's Medical Director for treating patients before and during transport, and both the Medical Director and the Authority monitor the quality of treatment and compliance to medical and operations protocols. The Authority and the contractor share the same system data for

use in monitoring, analysis and decision-making.

Primary funding for the Richmond Ambulance Authority is through user fees. RAA will bill commercial insurance companies, Medicare, Medicaid, hospitals, nursing homes, and/or the patient, but no person within the City of Richmond who truly needs ambulance service is denied treatment or transport. Additionally, the City of Richmond provides a subsidy (about 25% of the total budget) to assure equal access, quality treatment and rapid response to all areas of the City, regardless of the patient's ability to pay for services.

The Authority owns the infrastructure of the EMS system; all ambulances, medical equipment, 911 lines, radio system, CAD system, driving computers, etc., and handles all reimbursement and collections functions. The private operations contractor acting on the Authority's behalf is guaranteed payment for each transport (whether or not the Authority is reimbursed) and can thus concentrate fully on providing rapid response, quality patient care and superior dispatch center operations.

The Richmond Department of Fire and EMS (the City's Fire Department) provides a "first response" component to Richmond's EMS system, responding with RAA to pre-designated high-priority incidents with BLS (basic life support) personnel equipped with automated external defibrillators (AED's). Two volunteer rescue squads perform a limited number of ALS responses within the city, and are held to Authority standards relating to equipment, training and protocols, as well as operating under the auspices of the Authority's Medical Director. Patients who happen to be transported by a volunteer unit are not billed for service.

In a typical year the Richmond Ambulance Authority responds to more than 50,000 requests for assistance, and transports nearly 40,000 patients.

### **Strengths**

Rapid reliable EMS response to calls for assistance is RAA's hallmark. The system continues to operate in high-performance mode, solidly maintaining fractile response time percentages above the 90% level.

System status management (SSM), the scientific method to plan for and deploy resources, not only allows Richmond to maintain its challenging response time standards, but assures equal access to quality advanced prehospital care in all parts of the community.

Quality patient care is a shared responsibility between our world renowned Medical Director and the paramedics who practice as his extension. Firm but gentle medical oversight, and a full-time teaching frame of reference are signature strengths of the Authority.

Participation in emergency technologies and finding applications for these in EMS is strength of the Authority. The development of GIS-related applications to address day-to-day EMS needs, and to apply to QI and research initiatives, is just one example of this.

A solid fiscal base and system infrastructure are essential strengths of the Richmond Ambulance Authority, and represent stable continuity of services for the public. In addition, RAA's Board of Directors is extremely active and provides a vast fund of experience and expertise for the system to draw upon.

Top level management personnel at the Authority also share their experience, and gather the experiences of others internationally, to promote positive EMS practices in the United States and abroad.

### **Opportunities**

RAA is seizing its opportunity to increase participation in public health initiatives, such as injury and illness prevention, community focused health initiatives, research studies, ambulance utilization review, disaster management preparation, bioterrorism response, trauma system QI, pediatric EMS research, cardiac arrest research, product and procedure development initiatives, etc.

The Authority is committed to increasing efficiencies through continued application of emerging technologies (computer upgrades, continuing GIS technology, electronic data collection, refinement of ambulance deployment strategies, etc.).

There will be an opportunity to address some perceived system deficiencies with the current operations contractor when developing the RFP (request for proposal) document for the upcoming competition for the next operations contract. The Authority weights its selection process to more heavily consider quality and performance issues over cost.

### **Weaknesses**

A primary focus for a significant portion of the data currently saved in Authority databases relates to the need for obtaining reimbursement, while little of the actual treatment portion of patient care encounters finds its way into database format. This makes it challenging to monitor treatment protocols and algorithms effectively, as well as limiting the options for utilizing computer initiated resupply

strategies. (This weakness should cease to be an issue once electronic data collection by medics is implemented within the next year.)

Currently, and for a number of reasons, "over-utilization" of ambulance services exists within the system. As a practical issue, the Authority cannot obtain reimbursement from certain insurance payors on transports that are clearly not "medically necessary", but have consumed system resources. Elimination of as many transports as possible that fit the criteria of "non-medically necessary" would ease a portion of financial strain for the system, but still may not meet the needs of citizens who still have legitimate need for assistance, but do not meet the increasingly rigid "medical necessity guidelines" for reimbursement under the present system.

### **Threats**

Financial reimbursement is shrinking for ambulance services whose reimbursement is subject to federal and state regulation, as with Medicare and Medicaid patients, who represent nearly 60% of our transport population. Ambulance services must accept whatever the government designates as reimbursement for these patients, and they are not allowed to attempt additional recovery of costs from the patient. Managing system costs (which are of course increasing) in the face of this threat represents a significant long term challenge for the Richmond Ambulance Authority.

In Richmond, the EMS system essentially functions as a "safety net" for the public health system in Richmond, as many residents lack adequate medical insurance and comprehensive health care benefits. This results in a significantly higher level of ambulance utilization than in other U.S. cities of comparable size and population, which makes it difficult for



the Authority to recover the costs of service without subsidization from the City. The current City subsidy represents about 25% of system costs.

### **Summary**

As EMS and economic conditions evolve in the United States, many EMS delivery systems will be forced to examine themselves more closely, and from different perspectives, to maximize their ability to survive, both clinically and financially. New EMS treatments, procedures and equipment will be scrutinized, and physician medical directors and medical control boards will require evidence-based data as part of any significant justification in their decision-making processes.

Adaptable strategies must be developed for responding to regulatory, social and economic challenges to EMS, while maintaining adherence to stringent clinical and performance standards.

Richmond Ambulance Authority closely monitors the EMS industry in the United States, and is fortunate to have a structure which allows rapid response to meet specific challenges to the industry in a proactive manner.

### **Future**

EMS in Richmond will become a full partner in homeland security initiatives to protect and care for our citizens.

Electronic data collection will begin to provide the Richmond Ambulance Authority with

cleaner, more comprehensive data within the next year. Given the Authority's participation in numerous data-related initiatives, this technology will be a welcome improvement, and should further enhance RAA's ability to function at a high level both clinically and financially

Safe and thoughtful participation in proving and disproving potential EMS treatment modalities will continue in Richmond. Identifying and delivering patient-focused appropriate and timely interventions is part of the positive tradition of the Richmond Ambulance Authority.

The Authority will implement the Community Access Health Pilot (CHAP) program, where a specially trained nurse working in the EMS Communication Center will arrange more appropriate alternative services for callers once dispatch algorithms have ruled out the need for immediate ambulance deployment. This presents a unique challenge for the EMS Communications Center, but also may represent a potential solution to some of the resource/request inequities that currently exist for the Richmond Ambulance Authority, and for many others. In addition to the benefits represented by more appropriately dealing with citizen requests for assistance, this new "health services facilitator" role may eventually evolve into additional revenue streams as RAA considers partnering with diverse health care payors to more appropriately provide patient services within the community.

**Appendix 6 a:**  
**Indicators List of indicators**

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No.	Name of Indicator	Group of Indicators
0.1	Population covered by the EMS	Demography
0.2	Service area [km <sup>2</sup> ]	Demography
<b>1.0</b>	<b>Unit hours (ELS + BLS + ALS) per 100 000</b>	<b>HS / resources</b>
1.1	Unit hours ELS per 100 000	HS / resources
1.2	Unit hours BLS per 100 000	HS / resources
1.3	Unit hours ALS per 100 000	HS / resources
1.4	Unit hours BLS & ALS per km <sup>2</sup>	HS / resources
1.5	Unit hours ALS per km <sup>2</sup>	HS / resources
2.1	Unit hour utilisation BLS+ALS (transports)	HS / utilisation
2.2	Unit hour utilisation BLS+ALS (responses)	HS / utilisation
2.3	Unit hour utilisation BLS+ALS (time)	HS / utilisation
2.4	Unit hour utilisation ELS (responses)	HS / utilisation
2.5	Unit hour utilisation ALS (responses)	HS / utilisation
<b>3.1a</b>	<b>Response time interval [% in 480 sec]</b>	<b>HS / performance</b>
<b>3.1b</b>	<b>Response time interval 90% percentile [sec]</b>	<b>HS / performance</b>
3.2a	On scene time interval - mean [sec]	HS / performance
3.2b	On scene time interval - 90% percentile [sec]	HS / performance
3.3a	Transport time interval - mean [sec]	HS / performance
3.3b	Transport time interval - 90% percentile [sec]	HS / performance
4a	Time to first shock <= 240 sec [%]	HS / performance
4b	Time to first shock <= 480 sec [%]	HS / performance
4c	Time to first shock <= 720 sec [%]	HS / performance
4d	Time to first shock - 80% percentile [sec]	HS / performance
5.1	EMS calls annually (only medical emergencies)	
5.2	EMS calls annually per km <sup>2</sup>	HS / utilisation
5.3	EMS calls annually per inhabitant	HS / utilisation
6.1a	No. of highest priority responses	
<b>6.1b</b>	<b>Rate of highest priority responses per 100 000</b>	<b>HS / utilisation</b>
6.1c	Rate of highest priority responses per km <sup>2</sup>	HS / utilisation
6.1d	Percentage of highest priority responses of all BLS and ALS responses	HS / utilisation
6.2a	No. of highest priority responses leading to patient contact	
<b>6.2b</b>	<b>Rate of highest priority responses leading to patient contact per 100 000</b>	<b>HS / utilisation</b>
6.3a	No. of highest priority responses leading to patient contact and "treat and leave" or "confirmation of death"	
<b>6.3b</b>	<b>Rate of highest priority responses leading to patient contact and "treat and leave" or "confirmation of death" per 100 000</b>	<b>HS / utilisation</b>
6.4a	No. of highest priority response leading to patient transport	
<b>6.4b</b>	<b>Rate of highest priority response leading to patient transport per 100 000</b>	<b>HS / utilisation</b>

No.	Name of Indicator	Group of Indicators
7a	No. of responses with recognition of death on scene without starting resuscitation efforts	
7b	Rate of responses with recognition of death on scene without starting resuscitation efforts per 100 000	HS / utilisation
8.1.1a	No. of cardiac arrest incidents	
8.1.1b	Rate of cardiac arrest incidents per 100 000	Health status
8.1.2a	No. of cardiac arrest incidents with CPR attempt during EMS care	
8.1.2b	Rate of cardiac arrest incidents with CPR attempt during EMS care per 100 000	Health status
8.1.3a	No. of cardiac arrest incidents with presumed cardiac aetiology	
8.1.3b	Rate of cardiac arrest incidents with presumed cardiac aetiology per 100 000	Health status
8.1.4a	No. of cardiac arrest incidents with presumed cardiac aetiology and with CPR attempt during EMS care	
8.1.4b	Rate of cardiac arrest incidents with presumed cardiac aetiology and with CPR attempt during EMS care per 100 000	Health status
8.2a	No. of severe trauma incidents	
8.2b	Rate of severe trauma incidents per 100 000	Health status
8.3a	No. of severe difficulties in breathing	
8.3b	Rate of severe difficulties in breathing per 100 000	Health status
8.4a	No. of cardiac chest pain incidents	
8.4b	Rate of cardiac chest pain incidents per 100 000	Health status
8.5a	No. of stroke incidents	
8.5b	Rate of stroke incidents per 100 000	Health status
8.b	Rate of "First Hour Quintet" Incidences per 100 000	Health status
9a	No. of patients with initial GCS ? 8	
9b	Rate of patients with initial GCS ? 8 per 100 000	Health status
10a	No. of trauma patients with initial GCS ? 8	
10b	Rate of trauma patients with initial GCS ? 8 per 100 000	Health status
11.1a	Number of traffic injuries	
11.1b	Rate of traffic injuries per 100 000	Health status
11a	No. of trauma patients with RTS ? 5	
11b	Rate of trauma patients with RTS ? 5 per 100 000	Health status
12.1a	No. of patients with assisted ventilation	
12.1b	Rate of patients with assisted ventilation per 100 000	HS / performance
12.2a	No. of intubated patients	
12.2b	Rate of intubated patients per 100 000	HS / performance
12.3a	No. of patients receiving i.v. drug administration (no fluids)	
12.3b	Rate of patients receiving i.v. drug administration (no fluids) per 100 000	HS / performance
12.a	Number of Patients with ALS Interventions	
12.b	Rate of Patients with ALS Intervention per 100 000	HS / performance

**Table 9: Master List of Indicators (red: Key indicators; pink: Sub indicators to key indicators)**

**Appendix 6 b:**  
**Indicators accompanying documents**

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## 1.1 Unit Hours ELS

### **Name:**

Unit hours ELS

### **Nominal definition:**

Annual professional unit hours of ELS per 100,000 inhabitants

A unit hour is defined as a fully equipped response unit on a response or waiting for a response for one hour.

ELS is defined as emergency life support. This includes airway, breathing and circulation together with CPR without the use of a defibrillator.

For this indicator, ELS should be a legally contracted part of the organised EMS.

### **Operational definition:**

Annual no. of professional unit hours of ELS = no. of professional staffed hours of ELS added together over a 365 day period.

Annual professional unit hours of ELS per 100,000 inhabitants = annual number of professional unit hours of ELS divided by the total number of inhabitants, multiplied by 100,000.

### **Format:**

Rate (per 100,000)

Source of data:  
Deployment plan.

### **Upscaling:**

The indicator is available and meaningful on all scales reaching from the service area of one EMS station to the regional or national level.

### **Rationale:**

This indicator measures the availability of professional ELS. Emergency life support is an important part of the chain of survival. The second ring of the chain of survival indicates early CPR to buy time. In the event of cardiac arrest, if a defibrillator is delayed arriving at a patient, emergency life support will provide oxygenated blood to the brain in a limited form until such times as more advanced techniques including monitoring and a defibrillator can be made available.

### **Narrative:**

**Strength:** Data is easy to collect.

**Limitations:** This indicator provides no information about the quality of service.

### **References:**

Stout JL: System financing. In Roush WR (ed): Principles of EMS Systems. Dallas: ACEP, 1994, 451-473.

Overton J, Stout J: System Design. In Kuehl AE (ed): Prehospital Systems and Medical Oversight. 3<sup>rd</sup> ed., 2002

International Guidelines 2000 for CPR and ECC – A Consensus on Science. Resuscitation 46 (2000); 1-3: 1-448.

## 1.2 Unit Hours BLS

### **Name:**

Unit hours BLS

### **Nominal Definition:**

Annual unit hours of BLS per 100,000 inhabitants.

A unit hour is defined as a fully equipped response unit on a response or waiting for a response for one hour.

BLS is defined as basic life support. This includes CPR and the use of an AED.

### **Operational Definition:**

Annual no. of unit hours of BLS = no. of scheduled hours of BLS per day added together for a 365 day period.

Annual unit hours of BLS per 100,000 inhabitants = annual number of unit hours of BLS divided by the total number of inhabitants, multiplied by 100,000.

### **Format:**

Rate (per 100,000)

### **Source of Data:**

Deployment plan.

### **Upscaling:**

The indicator is available and meaningful on all scales reaching from the service area of one EMS station to the regional or national level.

### **Rationale:**

This indicator measures the resources for basic life support provided for the population. This objective refers to all units which are the providers of BLS including response cars, response motor cycles and transport units. BLS can provide all of the components for early resuscitation including clearing of the airway, respiratory support, cardiac massage and control of haemorrhage, and importantly in cardiac arrest provide a defibrillator and an operative qualified in its use. This makes up the second and third components of the chain of survival.

### **Narrative:**

**Strengths:** Data is easy to collect.

**Limitations:** This indicator provides no information about the quality of care.

### **References:**

Stout JL: System financing. In Roush WR (ed): Principles of EMS Systems. Dallas: ACEP, 1994, 451-473.

Overton J, Stout J: System Design. In Kuehl AE (ed): Prehospital Systems and Medical Oversight. 3<sup>rd</sup> ed., 2002

International Guidelines 2000 for CPR and ECC – A Consensus on Science. Resuscitation 46 (2000); 1-3: 1-448.

### 1.3 Unit Hours ALS

**Name:**

Unit hours ALS

**Nominal Definition:**

Annual unit hours of ALS per 100,000 inhabitants.

A unit hour is defined as a fully equipped response unit on a response or waiting for a response for one hour.

ALS is defined as advanced life support. This includes the use of endotracheal intubation to secure the airway, respiratory support by the use of bag and mask together with oxygen, defibrillation and i.v. drug administration of cardioactive drugs and IV fluids.

**Operational Definition:**

Annual no. of unit hours of ALS = no. of scheduled hours of ALS per day added together over a 365 days period.

Annual unit hours of ALS per 100,000 inhabitants = annual number of unit hours of ALS divided by the total number of inhabitants, multiplied by 100,000.

**Format:**

Rate (per 100,000)

**Source of Data:**

Deployment plan.

**Upscaling:**

The indicator is available and meaningful on all scales reaching from the service area of one EMS station to the regional or national level.

**Rationale:**

This indicator measures the resources for advanced life support provided for the population. ALS forms the fourth cycle of the chain of survival and is required to stabilise the patient prior to transportation to appropriate medical facility.

**Narrative:**

**Strength:** Data is easy to collect.

**Limitations:** This indicator provides no information about the quality of care.

**References:**

Stout JL: System financing. In Roush WR (ed): Principles of EMS Systems. Dallas: ACeP, 1994, 451-473.

Overton J, Stout J: System Design. In Kuehl AE (ed): Prehospital Systems and Medical Oversight. 3<sup>rd</sup> ed., 2002

International Guidelines 2000 for CPR and ECC – A Consensus on Science. Resuscitation 46 (2000); 1-3: 1-448.

### 1.4 Unit Hours BLS & ALS (Service Area)

**Name:**

Unit hours BLS & ALS (service area)

**Nominal Definition:**

Annual unit hours of BLS & ALS per km<sup>2</sup> of service area

A unit hour is defined as a fully equipped response unit on a response or waiting for a response for one hour.

**Operational Definition:**

Annual no. of unit hours of BLS & ALS = no. of scheduled hours of BLS + ALS per day added together for a 365 day period.

Annual unit hours of BLS & ALS per service area = annual number of unit hours of BLS & ALS divided by no. of km<sup>2</sup> of service area

**Format:**

Rate (per km<sup>2</sup> of service area)

**Source of Data:**

Deployment plan.

**Upscaling:**

The indicator is available but not meaningful on all scales because of difference in population density and geography.

**Rationale:**

Not all emergency calls require the assistance of an ALS unit and not all emergency calls require the assistance of a BLS unit. Therefore, there is some degree of interchangeability between the dispatching on these two resources. This objective reviews the provision per square kilometre to measure resources available on the geographical basis. BLS units can perform airway, breathing, circulation and defibrillation prior to the arrival of an ALS unit and can provide full resuscitation.

**Narrative:**

**Strengths:** Data is easy to collect.

**Limitations:** This indicator provides no information about the quality of service.

**References:**

Stout JL: System financing. In Roush WR (ed): Principles of EMS Systems. Dallas: ACeP, 1994, 451-473.

Overton J, Stout J: System Design. In Kuehl AE (ed): Prehospital Systems and Medical Oversight. 3<sup>rd</sup> ed., 2002

## 1.5 Unit Hours ALS (Service Area)

**Name:**

Unit hours ALS (service area)

**Nominal definition:**

Annual unit hours of ALS per km<sup>2</sup> of service area

A unit hour is defined as a fully equipped response unit on a response or waiting for a response for one hour.

**Operational definition:**

Annual no. of unit hours of ALS = no. of scheduled hours of ALS per day added together for each 365 day period.

Annual unit hours of ALS per service area = annual number of unit hours of ALS divided by no. of km<sup>2</sup> of service area

**Format:**

Rate (per km<sup>2</sup> of service area)

**Source of data:**

Deployment plan.

**Upscaling:**

The indicator is available but not meaningful on all scales because of difference in population density and geography.

**Rationale:**

This objective reviews the provision per square kilometre to measure resources available on the geographical basis.

Advanced life support forms the fourth cycle of the chain of survival and is required to stabilise the patient prior to transportation to appropriate medical facility.

**Narrative:**

**Strengths:** Data is easy to collect.

**Limitations:** This indicator provides no information about the quality of service.

**References:**

Stout JL: System financing. In Roush WR (ed): Principles of EMS Systems. Dallas: ACeP, 1994, 451-473.

Overton J, Stout J: System Design. In Kuehl AE (ed): Prehospital Systems and Medical Oversight. 3<sup>rd</sup> ed., 2002

## 2.1 Unit Hour Utilisation BLS & ALS (Transports)

**Name:**

Unit hour utilisation BLS & ALS (transports)

**Nominal Definition:**

Unit hour utilisation of BLS and ALS.

Unit hour utilisation is defined as how frequently the unit hour is used.

For this indicator, BLS and ALS transport are counted.

This indicator does not include any secondary activities like interhospital transfers, but only primary EMS response.

**Operational Definition:**

The number of BLS & ALS transports in a year divided by no. of unit hours in a year.

**Format:**

Ratio

**Source of Data:**

Deployment plan & database of the dispatch centre.

**Upscaling:**

This indicator is available but not meaningful on all scales.

**Rationale:**

This indicator describes both, the availability of response and the utilisation of the EMS system. Unit hour utilisation measures the efficiency of the EMS system and indicates the organisational structure of the system and how the resources are used.

This indicator focuses on the number of transports and excludes aspects such as patients deceased or "treat and leave".

**Narrative:**

**Strengths:** This indicator is easy and clear to calculate.

**Limitations:** Information is difficult to assess. For economic reasons, an EMS system should aim at a high utilisation ratio, but this may include longer response times and worse clinical outcomes at the same time. Utilisation ration should not be assessed without consideration of response times, geographical coverage, and clinical outcomes.

**References:**

Stout JL: System financing. In Roush WR (ed): Principles of EMS Systems. Dallas: ACeP, 1994, 451-473.

Overton J, Stout J: System Design. In Kuehl AE (ed): Prehospital Systems and Medical Oversight. 3<sup>rd</sup> ed., 2002



## 2.2 Unit Hour Utilisation BLS & ALS (Responses)

**Name:**

Unit hour utilisation BLS & ALS (responses)

**Nominal Definition:**

Unit hour utilisation of BLS and ALS.

Unit hour utilisation is defined as how frequently the unit hour is used.

For the indicator, BLS and ALS responses are counted. Response means any unit responding. Secondary activities like interhospital transfers are not included, but only primary EMS response.

**Operational Definition:**

The number of BLS & ALS responses in a year divided by the number of unit hours in a year.

**Format:**

Ratio

**Source of Data:**

Deployment plan & database of the dispatch centre.

**Upscaling:**

This indicator is available but not meaningful on all scales.

**Rationale:**

This indicator describes both, the availability of response and the utilisation of the EMS system. Unit hour utilisation measures the efficiency of the EMS system and indicates the organisational structure of the system and how the resources are used.

This indicator includes all responses as opposed to indicator no. 2.1 which excludes "treat and leave" patients and patients deceased.

**Narrative:**

**Strengths:** This indicator is easy and clear to calculate.

**Limitations:** Information is difficult to assess. For economic reasons, an EMS system should aim at a high utilisation ratio, but this may include longer response times and worse clinical outcomes at the same time. Utilisation ratio should not be assessed without consideration of response times, geographical coverage, and clinical outcomes.

**References:**

Stout JL: System financing. In Roush WR (ed): Principles of EMS Systems. Dallas: ACeP, 1994, 451-473.

Overton J, Stout J: System Design. In Kuehl AE (ed): Prehospital Systems and Medical Oversight. 3<sup>rd</sup> ed., 2002

## 2.3 Unit Hour Utilisation BLS & ALS (Time)

**Name:**

Unit hour utilisation BLS & ALS (time)

**Nominal Definition:**

Unit hour utilisation of BLS and ALS.

For this indicator, the time span the unit is occupied is compared to the time span of unit hours.

This indicator does not include any secondary activities like interhospital transfers, but only primary EMS response.

**Operational Definition:**

The time [minutes] of BLS and ALS responses in a year divided by the time [minutes] of unit hours in a year.

**Format:**

Ratio

**Source of Data:**

Deployment plan & database of the dispatch centre.

**Upscaling:**

This indicator is available but not meaningful on all scales.

**Rationale:**

This indicator describes both, the availability of response and the utilisation of the EMS system. Unit hour utilisation measures the efficiency of the EMS system and indicates the organisational structure of the system and how the resources are used.

Opposed to indicators no. 2.1 and 2.2, this indicator provides the most precise information as it compares the time the vehicle is occupied with the time of unit hours.

**Narrative:**

**Strengths:** This indicator provides the most precise information.

**Limitations:** Data is difficult to get. Information is difficult to assess. For economic reasons, an EMS system should aim at a high utilisation ratio, but this may include longer response times and worse clinical outcomes at the same time. Utilisation ratio should not be assessed without consideration of response times, geographical coverage, and clinical outcomes.

**References:**

Stout JL: System financing. In Roush WR (ed): Principles of EMS Systems. Dallas: ACeP, 1994, 451-473.

Overton J, Stout J: System Design. In Kuehl AE (ed): Prehospital Systems and Medical Oversight. 3<sup>rd</sup> ed., 2002.

## 2.4 Unit Hour Utilisation ELS (Responses)

**Name:**

Unit hour utilisation ELS (responses)

**Nominal Definition:**

Unit hour utilisation of ELS.

Unit hour utilisation is defined as how frequently the unit hour is used.

For this indicator, only ELS responses are counted.

This indicator includes only primary EMS response responded to a result of an emergency activation.

**Operational Definition:**

Number of ELS responses in a year divided by the number of unit hours in a year.

**Format:**

Ratio

**Source of Data:**

Deployment plan & database of the dispatch centre.

**Upscaling:**

This indicator is available but not meaningful on all scales.

**Rationale:**

This indicator describes both, the availability of response and the utilisation of ECS within the EMS system. Unit hour utilisation measures the efficiency of the EMS system and indicates the organisational structure of the system and how the resources are used.

This indicator focuses on the number of transports and excludes aspects such as patients deceased or "treat and leave".

**Narrative:**

**Strengths:** Provides an indicative effectiveness of the initial response to cardiac arrest.

**Limitations:** This indicator is very difficult to calculate. Information is difficult to assess. For economic reasons, an EMS system should aim at a high utilisation ratio, but this may include longer response times and worse clinical outcomes at the same time. Utilisation ration should not be assessed without consideration of response times and clinical outcomes.

**References:**

Stout JL: System financing. In Roush WR (ed): Principles of EMS Systems. Dallas: ACeP, 1994, 451-473.

Overton J, Stout J: System Design. In Kuehl AE (ed): Prehospital Systems and Medical Oversight. 3<sup>rd</sup> ed., 2002

## 2.5 Unit Hour Utilisation ALS (Responses)

**Name:**

Unit hour utilisation ALS (responses)

**Nominal Definition:**

Unit hour utilisation of ALS.

Unit hour utilisation is defined as how frequently the unit hour is used.

For this indicator only ALS responses are counted.

This indicator does not include any secondary activities like interhospital transfers, but only primary EMS response.

**Operational Definition:**

Number of ALS responses in a year divided by the number of unit hours in a year.

**Format:**

Ratio

**Source of Data:**

Deployment plan & database of the dispatch centre.

**Upscaling:**

This indicator is available but not meaningful on all scales.

**Rationale:**

This indicator describes both, the availability of response and the utilisation of the EMS system. Unit hour utilisation measures the efficiency of the EMS system and indicates the organisational structure of the system and how the resources are used.

This indicator focuses on the number of transports and excludes aspects such as patients deceased or "treat and leave".

**Narrative:**

**Strengths:** This indicator is easy and clear to calculate.

**Limitations:** Information is difficult to assess. For economic reasons, an EMS system should aim at a high utilisation ratio, but this may include longer response times and worse clinical outcomes at the same time. Utilisation ratio should not be assessed without consideration of response times, geography, population density, call volume and clinical outcomes.

**References:**

Stout JL: System financing. In Roush WR (ed): Principles of EMS Systems. Dallas: ACeP, 1994, 451-473.

Overton J, Stout J: System Design. In Kuehl AE (ed): Prehospital Systems and Medical Oversight. 3<sup>rd</sup> ed., 2002

### 3.1 EMS Response Time Interval

#### **Name:**

EMS response time interval

#### **Nominal Definition:**

The interval of time between when the ambulance starts moving ("en route") of any regular EMS unit (ELS, BLS, ALS) by the respective dispatch centre (unit activated) and its arrival on scene (= stop of emergency vehicle) for any life-threatening emergency. The time is taken for the first dispatched EMS unit arriving at the scene.

#### **Operational Definition:**

Response time interval [sec] = tarrival at scene [sec] - t"en route" [sec]

#### **Format:**

- a) Percentage of all EMS responses p.a. which had a response interval of  $\leq 480$  seconds [%]
- b) 90% percentile of response intervals for all EMS responses p.a. [sec]

#### **Source of Data:**

For almost all EMS systems this data is available directly from the data base of the EMS dispatch centre. For the few systems which can not generate this data out of the dispatch centre's data base a second source is the compulsory documentation (run sheets) filled out by the EMS field crews for any emergency call.

Caveat: For calculation of response intervals the two sources must not be combined due to possible differences in between clocks.

#### **Up-Scaling:**

The indicator is available and meaningful on all scales reaching from the service area of one EMS station to the regional or national level.

#### **Rationale:**

The indicator measures the access to pre-hospital emergency care for patients who presumably are in life-threatening conditions and for whom pre-hospital care has been demanded through the EMS system (dispatch centre) in the respective region/member country. The indicator describes the ability of any health system to generate EMS response to emergency demand. Using the same data the indicator is presented in two formats. Format A indicates the ability of the system to meet the international accepted 8 minutes benchmark. Format B indicates the level of response interval reliability the respective health care system generates. Responding to life-threatening emergencies is time-critical. Therefore, the data has to be provided in the way of percentiles. Average response times (mean, median, etc.) are not only misleading, they are also clinically inappropriate.

#### **Narrative:**

**Strengths:** Rather than merely measuring the physical infrastructure (number of stations, vehicles, personnel, etc.) of any EMS system, the indicator precisely reflects the availability of emergency care upon demand for life-threatening situations in a standardised and comparable way. The chances of survival of emergency patients depend on the time of first care (cf. "First Hour Quintet"). Access to pre-hospital emergency care is a direct function of the system's ability to respond timely to any identified emergency demand. Therefore, based on standardised data available from any EMS system, the indicator provides

one basic benchmark for comparing EMS systems throughout Europe.

**Limitations:** The process of providing pre-hospital care is composed of many more distinct time intervals. All of them have to be carefully considered for any detailed system analysis or system comparison. Some of them are clinically even more relevant (for example, time to first shock on cardiac arrest patients).

The response interval does not include the time from incident to calling for help nor does it include the time spend on call taking and dispatching. However, due to a broad variety of system designs, for most intervals there are also several ways of generating and analysing this data. This significantly reduces the overall comparability. In addition, throughout Europe there are differences in the use and availability of information technology within the EMS systems, again limiting the comparability of data.

#### **References:**

1. Cummins RO, Chamberlain DA, Abramson NS, Allen M, Baskett PJ, Becker L, Bossaert L. Recommended guidelines for uniform reporting of data from out-of-hospital cardiac arrest: the Utstein Style. A statement for health professionals from a task force of the American Heart Association, the European Resuscitation Council, the Heart and Stroke Foundation of Canada, and the Australian Resuscitation Council. *Circulation*. 1991 Aug;84(2):960-75.
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3. Pons PT, Markovchick VJ. Eight minutes or less: does the ambulance response time guideline impact trauma patient outcome? *J Emerg Med*. 2002 Jul;23(1):43-8.
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6. Pell JP, Sirel JM, Marsden AK, Ford I, Cobbe SM. Effect of reducing ambulance response times on deaths from out of hospital cardiac arrest: cohort study. *BMJ* 2001 Jun 9;322(7299):1385-8.
7. Krafft T, Castrillo Riesgo LG, Edwards S, Fischer M, Overton J, Robertson-Steel I, König, A. European Emergency Data Project (EED Project). EMS Data-based Health Surveillance System. *European Journal of Public Health* 2003; 13(supplement): in print.

### 3.2 EMS on scene time interval

**Name:**

EMS on scene time interval

**Nominal Definition:**

The mean of all time intervals between the arrival of the first regularly dispatched EMS unit at an emergency scene (=stop of emergency vehicle) and the time of starting the transport of the respective emergency patient to the next level of care.

**Operational Definition:**

a) Mean of on scene time interval [sec] =  $\frac{\sum t_{\text{starting transport}} [\text{sec}] - t_{\text{arrival at scene}} [\text{sec}]}{n}$

n

b) 90% percentile of on scene time intervals for all EMS responses p.a. [sec]

**Format:**

a) Mean [sec]

b) 90% percentile of response intervals for all EMS responses p.a. [sec]

**Source of Data:**

For almost all EMS systems this data is available directly from the data base of the EMS dispatch centre. For the few systems which can not generate this data out of the dispatch centre's data base a second source is the compulsory documentation (run sheets) filled out by the EMS field crews for any emergency call.

Caveat: cf. Indicator 3.1

**Up-Scaling:**

Cf. Indicator 3.1

**Rationale:**

The indicator identifies the amount of time spent on pre-hospital treatment before the actual transport process starts. It is therefore an indirect measurement for the underlying system design (i. e. stabilise on scene or treat and release).

**Narrative:**

**Strengths:** If the system design and the concept of provision of care for respective system is known and well

understood, the indicator can be used as an important benchmark for comparing EMS provision.

**Limitations:** The on scene time can be influenced by non-medical factors at the scene like patient trapped, difficult access to the actual patient site, etc. It is not necessarily an indication of time spent on medically essential treatment.

**References:**

1. Cummins RO, Chamberlain DA, Abramson NS, Allen M, Baskett PJ, Becker L, Bossaert L. Recommended guidelines for uniform reporting of data from out-of-hospital cardiac arrest: the Utstein Style. A statement for health professionals from a task force of the American Heart Association, the European Resuscitation Council, the Heart and Stroke Foundation of Canada, and the Australian Resuscitation Council. *Circulation*. 1991 Aug;84(2):960-75.

2. Spaite D, Benoit R, Brown D, Cales R, Dawson D, Glass C, Kaufmann C, Pollock D, Ryan S, Yano EM. Uniform prehospital data elements and definitions: a report from the uniform prehospital emergency medical services data conference. *Ann Emerg Med*. 1995 Apr;25(4):525-34.

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4. Nichol G, Detsky AS, Stiell IG, O'Rourke K, Wells G, Laupacis A. Effectiveness of emergency medical services for victims of out-of-hospital cardiac arrest: a metaanalysis. *Ann Emerg Med*. 1996 Jun;27(6):700-10.

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6. Pell JP, Sirel JM, Marsden AK, Ford I, Cobbe SM. Effect of reducing ambulance response times on deaths from out of hospital cardiac arrest: cohort study. *BMJ* 2001 Jun 9;322(7299):1385-8.

7. Krafft T, Castrillo Riesgo LG, Edwards S, Fischer M, Overton J, Robertson-Steel I, König, A. European Emergency Data Project (EED Project). EMS Data-based Health Surveillance System. *European Journal of Public Health* 2003; 13(supplement): in print.

### 3.3 Transport time interval

**Name:**

Transport time interval

**Nominal Definition:**

The mean of all time intervals between the time of starting the transport and the arrival at the hospital (=stop of emergency vehicle).

**Operational Definition:**

a) Mean of transport time interval [sec] =  $\frac{\sum t_{\text{arrival at next level of care}}[\text{sec}] - t_{\text{starting transport}}[\text{sec}]}{n}$

n

b) 90% percentile of transport time intervals for all EMS transports p. a. [sec]

**Format:**

a) Mean [sec]

b) 90% percentile of transport time intervals for all EMS transports p. a. [sec]

**Source of Data:**

For almost all EMS systems this data is available directly from the data base of the EMS dispatch centre. For the few systems which can not generate this data out of the dispatch centre's data base a second source is the compulsory documentation (run sheets) filled out by the EMS field crews for any emergency call.

Caveat: cf. Indicator 3.1

**Up-Scaling:**

Cf. Indicator 3.1

**Rationale:**

The indicator identifies the mean time for transporting emergency patients to the next level of care. Clinical studies have meanwhile established beyond doubt that the outcome of emergency patients is influenced by the length of time spent on patient transport. Therefore the indicator, especially in combination with indicators 3.1, 3.2 and 3.3, gives critical information for the effectiveness of pre-hospital care in any region.

**Narrative:**

**Strengths:** The indicator is an important component of the total process of providing pre-hospital care. It can be

used to identify important deficiencies for any region and also to understand differences between regions.

**Limitations:** The indicator is influenced by a variety of factors: traffic flow patterns, geographical factors, road infrastructure, hospital network, population density, etc. Therefore, a cautious interpretation is needed while using the indicator in comparing different regions.

**References:**

1. Cummins RO, Chamberlain DA, Abramson NS, Allen M, Baskett PJ, Becker L, Bossaert L. Recommended guidelines for uniform reporting of data from out-of-hospital cardiac arrest: the Utstein Style. A statement for health professionals from a task force of the American Heart Association, the European Resuscitation Council, the Heart and Stroke Foundation of Canada, and the Australian Resuscitation Council. *Circulation*. 1991 Aug;84(2):960-75.
2. Spaite D, Benoit R, Brown D, Cales R, Dawson D, Glass C, Kaufmann C, Pollock D, Ryan S, Yano EM. Uniform prehospital data elements and definitions: a report from the uniform prehospital emergency medical services data conference. *Ann Emerg Med*. 1995 Apr;25(4):525-34.
3. Pons PT, Markovchick VJ. Eight minutes or less: does the ambulance response time guideline impact trauma patient outcome? *J Emerg Med*. 2002 Jul;23(1):43-8.
4. Nichol G, Detsky AS, Stiell IG, O'Rourke K, Wells G, Laupacis A. Effectiveness of emergency medical services for victims of out-of-hospital cardiac arrest: a metaanalysis. *Ann Emerg Med*. 1996 Jun;27(6):700-10.
5. Valenzuela TD, Spaite DW, Meislin HW, Clark LL, Wright AL, Ewy GA. Emergency vehicle intervals versus collapse-to-CPR and collapse-to-defibrillation intervals: monitoring emergency medical services system performance in sudden cardiac arrest. *Ann Emerg Med*. 1993 Nov;22(11):1678-83.
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#### 4 Time to first shock

**Name:**

Time to first shock

**Nominal Definition:**

In our EED project the definition of "time to first shock" must be the interval from "call received in the dispatch centre" to the "first defibrillatory shock" delivered by any regular EMS unit (BLS, ALS or first responder), because the time of collapse is often unknown in cardiac arrest victims.

Cardiac arrest cases with first rhythm = VF

**Operational Definition:**

Time to first shock [sec] =  $t_{\text{shock}}$  [sec] -  $t_{\text{call received}}$  [sec]

**Format:**

Seconds [sec]

- a) Proportion for  $\leq 240$  sec [%]
- b) Proportion for  $\leq 480$  sec [%]
- c) Proportion for  $\leq 720$  sec [%]
- d) Time for delivering the first shock to 80% of the patients in VF [sec]

**Source of Data:**

For almost all EMS systems these data are available directly from the compulsory documentation (run sheets) filled out by the EMS field crews for any emergency call.

**Up-Scaling:**

The indicator is available and meaningful on all scales reaching from the service area of one EMS station to the regional or national level.

**Rationale:**

Early defibrillation is the most important factor of successful resuscitation of patients in ventricular fibrillation [1-3].

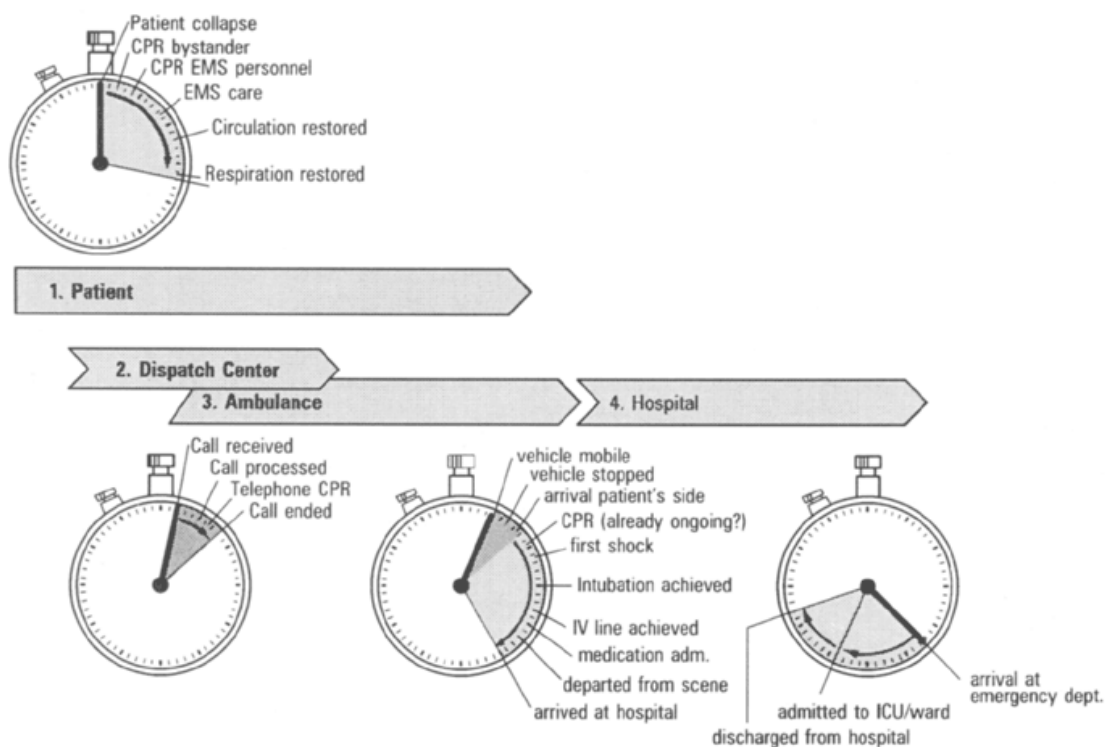
EMS systems should focus attention toward recording the moment in real time when the first shock is delivered. The time interval from call reception to first shock serves as a key evaluative measure for many other components of an emergency system. This time interval is influenced, firstly, by the efficiency of the dispatch system that processes the calls quickly and activates the appropriate responding units, and, secondly, by the quality of the responding units in doing their skills rapidly and perform defibrillation in accordance to predefined standing orders. The best way to obtain this time information is by using the time documentation of the dispatch centre and the event documentation of the external defibrillators, if these clocks are synchronized. Both systems will then provide precise time documentation and additionally detail information of the initial cardiac rhythm and efficiency of the therapy.

**Narrative:**

**Strengths:** The indicator precisely reflects the efficiency of an emergency system as an overall measurement of performance. The speed of the EMS system to react to one of the most life-threatening circumstances can be measured and compared. Therefore, based on standardised data available from any EMS system, this indicator provides one basic benchmark for comparing EMS systems throughout Europe.

**Limitations:** Because the "time of patient collapse" is difficult to measure precisely, especially in cases of unwitnessed cardiac arrest, we should focus in the EED project on the interval  $t_{\text{shock}} - t_{\text{call received}}$ , although we lose some information about the quality of the bystanders in the different systems.

**Figure 1: The watches of the Utstein-Style**



## **References:**

1. Ladwig, K.H., et al., Effects of early defibrillation by ambulance personnel on short- and long-term outcome of cardiac arrest survival: the Munich experiment. *Chest*, 1997. 112(6): p. 1584-91.
2. Mosesso, V.N., Jr., et al., Use of automated external defibrillators by police officers for treatment of out-of-hospital cardiac arrest [In Process Citation]. *Ann Emerg Med*, 1998. 32(2): p. 200-7.
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14. Herlitz, J., et al., Prognosis among survivors of prehospital cardiac arrest. *Ann Emerg Med*, 1995. 25(1): p. 58-63.
15. Herlitz, J., et al., Risk indicators for, and symptoms associated with, death among patients hospitalized after out-of-hospital cardiac arrest. *Coron Artery Dis*, 1994. 5(5): p. 407-14.
16. Herlitz, J., et al., Survival in patients found to have ventricular fibrillation after cardiac arrest witnessed outside hospital. *Eur Heart J*, 1994. 15(12): p. 1628-33.

## 5.1 Population covered by the EMS

### **Name:**

Population covered by the EMS

### **Nominal Definition:**

Annual number of possible users of the system.

### **Operational Definition:**

Annual number of citizens in the area cover by the EMS system.

### **Format:**

Annual number of citizens with specific attention to the following.

Age banding groups: under 16, 16-65, above 65.

### **Source of Data:**

Census data.

### **Upscaling:**

Useful at any scale.

### **Rationale:**

This indicator constitutes the basis for any calculation in which events must be related to number of persons served by the system. It is necessary to adjust the number of events per population served to produce indicators that can be compared in between system. This indicator is also used in the same system for trends along the time. The number of possible user also reflects the size of the system and allows system use analysis.

### **Narrative:**

EMS are based on a certain area and usually geographical limits are clear. Population covered by an EMS is the population that on a specific date and time is within that area, and this figure is modified along the day, week and year. Keeping in mind this limitation, an estimator of the population that EMS serves constitutes a basic piece of information to produce other indicators, in which population can

be the denominator, or can be used to standardise the information.

**Strengths:** Number of inhabitants from a certain area is easily obtained from an official resource like the census, also with other socio-demographic characteristics of the population. Periodical reviews permit the updating of the information.

**Limitations:** Frequently, there are important variations in the number of citizens in a certain area. There are daily movements, in the morning to the working places and in the evening to the residential areas. This influx-reflux movement is patent in big cities or in industrial areas and clearly affects the demand on EMS.

On an annual basis, the vacational areas can suffer important variations in the number of citizens, it can be on a daily basis or during a certain season.

Certain activities like airports, highways, sports produce concentrations of population that are difficult to measure.

Number of citizens served by an EMS is not enough information, and other characteristics like population density, access to care and socio-demographic factors can affect the use of the system.

### **References:**

Zachariah B, Pepe P. The development of emergency medical dispatch in the USA: a historical perspective. *European Journal of Emergency Medicine*. 1995;2:109-112.

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Eisenberg M, et al. Identification of cardiac arrest by emergency dispatchers. *Am J Emerg Med*. 1986;4:4.



### 5.3 EMS calls (only medical emergencies)

**Name:**

Number of EMS calls

**Nominal Definition:**

Number of EMS calls received in the dispatch centre.

- a) Annual number of EMS calls
- b) Annual number of EMS calls per km<sup>2</sup>
- c) Annual number of EMS calls per population

**Operational Definition:**

- a) Annual number of EMS calls
- b) Annual number of EMS calls divided by service area in km<sup>2</sup>
- c) Annual number of EMS calls divided by total no. of population in service area

**Format:**

- a) Rate (per km<sup>2</sup>)
- b) Rate (per population served)

**Source of data**

Dispatch centre information.

**Upscaling:**

Important variations due to density of population modify the value at different scales.

**Rationale:**

**Narrative:**

**Strength:** Easy to obtain, and a good indicator for implantation of the EMS in the community.

**Limitations:** Some factors like the coexistence of other dispatch centres for medical problems or the structure of the emergency system can introduce important modifications in this value.

**References:**

## 6.1 Highest Priority Responses

### **Name:**

Highest priority responses

### **Nominal Definition:**

The annual number of responses for which an EMS unit is dispatched to a perceived life-threatening emergency per 100,000 inhabitants.

Highest priority = life-threatening, as defined by the local EMS system, including First Hour Quintet conditions

### **Operational Definition:**

- a) Annual no. of highest priority responses
- b) Annual no. of highest priority responses divided by total no. of inhabitants multiplied by 100,000.
- c) Annual no. of highest priority responses divided by km<sup>2</sup> of service area.
- d) Annual no. of highest priority responses divided by the total number of ALS and BLS responses multiplied by 100 [%].

### **Format:**

- a) Number
- b) Rate per 100,000 inhabitants
- c) Rate per km<sup>2</sup>
- d) Percentage [%]

### **Source of Data:**

Because this indicator assesses the prioritization of information received from the requestor of service and dispatch of the EMS unit, the data must be derived directly from the database of the EMS dispatch centre. EMS field crew documentation can not be considered a source as compulsory documentation may not be required until patient contact.

### **Upscaling:**

### **Rationale:**

This indicator benchmarks patient access to EMS systems in three ways. First, the indicator captures the total number of requests for highest priority responses, a potential determinant of the overall health of the inhabitants. Second, the indicator can be used to analyze calls that are prioritized as life-threatening compared to those prioritized as non-life-threatening to determine proper protocol utilization. Third, by establishing a rate per 100,000 inhabitants, both system access and dispatcher actions can be compared to other EMS systems.

### **Narrative:**

**Strengths:** If an emergency patient has a chance of surviving a life-threatening emergency, optimum access must be provided for all inhabitants. Further, once access is achieved by the patient or the bystander, care must begin when the telephone first rings in the dispatch centre. The patient's symptoms must be accurately and quickly prioritized and proper resources committed to a response. This indicator assesses and compares utilization of the system for life-threatening responses and allows for a comparison to other regions/member countries.

**Limitations:** As EMS has evolved in different regions/countries, its utilization has varied. In some, there may be reluctance for its inhabitants to access Emergency Medical Services with the result that the patient is delivered directly to the hospital by family or friends. Therefore, utilization is reduced as compared to EMS systems that have actively promoted an emergency access number as the first link in the "Chain of Survival."

A second limitation is dispatcher training. Until recently, EMS dispatching has been nothing more than call taking with little attempt to prioritize the call or provide pre-arrival instructions. The variation in dispatch may be a limiting factor in benchmarking.

### **References:**

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## **6.2 Highest Priority Responses Leading to Patient Contact**

### **Name:**

Highest priority responses leading to patient contact

### **Nominal Definition:**

Annual rate of responses for which an EMS unit is dispatched to a life-threatening emergency and the response results in the unit arriving at the scene and an EMS provider has an interaction with the patient per 100,000 inhabitants.

### **Operational Definition:**

- a) Annual no. of highest priority responses leading to patient contact (including death patients)
- b) Annual no. of highest priority responses leading to patient contact (including death patients) divided by total no. of inhabitants multiplied by 100,000.

### **Format:**

- a) Number
- b) Rate per 100,000 inhabitants

### **Source of Data:**

For all EMS systems, data will be derived directly from the documentation completed by the EMS provider. While perhaps obtainable from the EMS dispatch center, it can not be considered reliable. Documentation completed by the EMS provider will contain a basic assessment of the patient.

### **Upscaling:**

### **Rationale:**

The indicator provides a measure for which a response is dispatched for a life-threatening emergency and there is a subsequent interaction with a patient. This indicator eliminates responses in which a provider is dispatched to a false request for service or is cancelled prior to arrival at

the scene. Also excluded will be those responses when obviously a death has occurred and resuscitation is not appropriate.

### **Narrative:**

**Strengths:** It is important that each stage, or interval, of a response be measured. This indicator is the initial stage. It is useful as a benchmark when comparison of rates is conducted between respective region/member countries as it provides important data for system access. Providing a rate for patient contact can also provide an indicator for planning the number of resources that will be needed for deployment to ensure an appropriate response time for the temporal and geographic demand.

**Limitations:** The definition of "patient contact" can lead to different interpretations among the different respective regions/member countries. To ensure accurate benchmarking, it will be important this term be specifically defined.

### **References:**

Zachariah B, Pepe P. The development of emergency medical dispatch in the USA: a historical perspective. *European Journal of Emergency Medicine*. 1995;109-112.

Clawson J, Dernocoeur K. *Principles of Emergency Medical Dispatch*. 3<sup>rd</sup> ed. Salt Lake City, UT: Priority Press; 2000.

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### **6.3 Highest Priority Response Leading to Patient Contact and "Treat and Leave"**

**Name:**

Highest priority response leading to patient contact and "treat and leave"

**Nominal Definition:**

The annual rate of responses for which an EMS unit is dispatched to a life threatening emergency and the EMS field personnel interact with a patient and provide assessment and/or treatment per 100,000 inhabitants.

**Operational Definition:**

- a) Annual no. of highest priority responses leading to patient contact and "treat and leave" (including death patients)
- b) Annual no. of highest priority responses leading to patient contact and "treat and leave" (including death patients)

**Format:**

- a) Number
- b) Rate per 100,000 inhabitants

**Source of Data:**

Data for this indicator must be derived from the compulsory documentation completed by EMS field crews for highest priority responses.

**Rationale:**

This indicator is a measurement of the utilization of the system for patients demonstrating medical necessity, but whose injury or illness is not of a severity that requires transportation to the hospital. This measurement also provides an indicator for the capabilities of the EMS field personnel with respect to their field assessment and treatment of patients. Respective region/member countries that respond with highly skilled personnel will have a higher rate for "Treat and Leave" patients.

**Narrative:**

**Strengths:** As the gatekeeper to healthcare, Emergency Medical Services is becoming increasingly required to assess and treat patients without transporting the patients to definitive care. This requires EMS field personnel to have additional training and new skills. By utilizing rate as the indicator, trends can be analyzed to determine the effectiveness of these new skills. The trends will also identify shifts in utilization that reflects an increase in "Treat and Leave" and a corresponding decrease in "Patient Transports."

**Limitations:** This indicator assumes that the EMS field personnel are accurately assessing patients and providing appropriate treatment. Because of the lack of diagnostic tools on an ambulance, "treat and leave" can be left to the discretion of the individual EMS field person and can be dependent upon the circumstance. Universal protocols for "treat and leave" have not been adopted.

**References:**

Zachariah B, Pepe P. The development of emergency medical dispatch in the USA: a historical perspective. *European Journal of Emergency Medicine*. 1995;109-112.

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Overton J, Stout J: System Design. In Kuehl AE (Ed): *Prehospital Systems and Medical Oversight*. 3<sup>rd</sup> ed., 2002.

Braun O, McCallion R, Fazackerly J: Characteristics of midsized urban EMS systems. *Ann Emerg Med* 1990; 19:536-546.

#### **6.4 Highest Priority Responses Leading to Patient Transport**

**Name:**

Highest priority responses leading to patient transport

**Nominal Definition:**

The annual rate of responses for which an EMS unit is dispatched to a life threatening emergency and the patient is transported per 100,000 inhabitants.

**Operational Definition:**

- a) Annual no. of highest priority responses leading to patient transport
- b) Annual no. of highest priority responses leading to patient transport

**Format:**

- a) Number
- b) Rate per 100,000 inhabitants

**Source of Data:**

The data for this indicator is generated from the compulsory documentation completed by an EMS provider. This data can also be obtained from most EMS dispatch centres when the dispatcher records the status of an ambulance when transporting a patient.

**Upscaling:**

**Rationale:**

The indicator measures the rate in which EMS provider transport patients needing both the highest level of response and a definitive care centre for treatment. These responses require total utilization of resources. Time on task becomes a secondary measurement because of its relationship to unit hour utilization and economic efficiency. In summary, the number, and appropriateness of a transport is important from the clinical perspective, and

the rate is important to determine the total cost for utilizing the system.

**Narrative:**

**Strengths:** The need to measure the rate of transport of those seriously injured or ill forms the foundation for the structure of the EMS system. By differentiating between those patients in which the system "treats and leaves" and those patients which require transport, the EMS system can be fundamentally designed to reliably meet the needs of patients requiring medical assistance while simultaneously optimizing economic efficiency for the payer.

**Limitations:** The lack of formalized quality improvement programs makes comparison of this rate difficult. Continual oversight as to whether both dispatch and EMS field personnel are accurately assessing patients and appropriately transporting patients is required to ensure accuracy. Further, the difference in protocols from the different systems makes benchmarking the indicator challenging.

**References:**

Zachariah B, Pepe P. The development of emergency medical dispatch in the USA: a historical perspective. *European Journal of Emergency Medicine*. 1995;109-112.

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Braun O, McCallion R, Fazackerly J: *Characteristics of midsized urban EMS systems*. *Ann Emerg Med* 1990; 19:536-546.

## **7 Responses with Recognition of Death on Scene without Starting Resuscitation Efforts**

### **Name:**

Responses with recognition of death on scene without starting resuscitation efforts

### **Nominal Definition:**

- a) Annual number of all EMS responses leading to a confirmation of death without starting any resuscitation efforts on scene
- b) Annual rate of all EMS responses leading to a confirmation of death without starting any resuscitation efforts on scene per 100,000 inhabitants
- c) Percentage of all EMS responses leading to a confirmation of death without starting any resuscitation efforts on scene compared to all highest priority EMS responses

### **Operational Definition:**

- a) Annual number of deaths on scene confirmed on arrival of EMS without CPR attempt
- b) Annual number of deaths on scene confirmed on arrival of EMS without CPR attempt divided by total no. of inhabitants, multiplied by 100,000
- c) Annual number of deaths on scene confirmed on arrival of EMS without CPR attempt divided by the number of all highest priority EMS responses [%]

### **Format:**

- a) Number
- b) Rate per 100,000 inhabitants
- c) Percentage [%]

### **Source of Data:**

This data are available directly from the data base of the EMS dispatch centre or the compulsory documentation (run sheets) filled out by the EMS providers for any emergency call.

### **Up-Scaling:**

The indicator is available and meaningful on all scales reaching from the service area of one EMS station to the regional or national level (weighted means according to population).

### **Rationale:**

The indicator measures the amount of confirmed deaths by the EMS provider on arrival at scene, and therefore is part of the process to calculate incidences of CPR attempts and resuscitation success rates as considered by the Utstein Style templates.

It is important to know, that confirmation of death is a specification, which is different in many countries. Not in every country confirmation of death is the task of a medical doctor. In some ones the paramedics are allowed to do so, in others the general practitioner or the emergency physician will do the confirmation of death at scene. The number of confirmed deaths can be an indirect indicator of the system performance in the way that a high number might correspond to a low quality of EMS care, because the patients are definitely dead when EMS units are arriving and therefore will not start CPR attempts.

### **Narrative:**

**Strengths:** The parameter gives an extra value in comparing different EMS systems. It is an indirect marker that other indicators have to be improved, e.g. long response times lead to a high number of confirmations of death

**Limitations:** The indicator has to be compared with other parameters. It does not directly reflect the performance of a system. Confirmation of death is not a standardized procedure in all of the participating countries.

### **References:**

See 8.1b/8.1c

- 8.1.1. Cardiac Arrest Incidents**
- 8.1.2. Cardiac Arrest Incidents with CPR attempt during EMS care**
- 8.1.3. Cardiac Arrest Incidents with presumed cardiac origin**
- 8.1.4. Cardiac Arrest Incidents with presumed cardiac origin and with CPR attempt during EMS care**

**Name:**

Cardiac arrest incidents

**Nominal Definition (8.1.1. or 8.1.3.):**

- a) Annual number of cardiac arrest patients
- b) Annual rate of cardiac arrest patients per 100,000 inhabitants
- c) Percentage of cardiac arrest patients compared to all highest priority EMS responses

**Nominal Definition (8.1.2. or 8.1.4.):**

- a) Annual number of cardiac arrests with CPR attempt of EMS-providers even if ALS-teams stopped
- b) Annual rate of cardiac arrests with CPR attempt of EMS-providers even if ALS-teams stopped CPR per 100,000 inhabitants
- c) Percentage of cardiac arrests with CPR attempt of EMS-providers even if ALS-teams stopped CPR compared to all highest priority EMS responses

**Operational Definition:**

- a) Annual number of cardiac arrest patients
- b) Annual number of cardiac arrest patients divided by total number of inhabitants, multiplied by 100,000
- c) Annual number of cardiac arrest patients divided by the number of all highest priority EMS responses [%]

Defining cardiac arrest patients as those found without vital signs (no pulse, no breathing and being unconscious).

**Operational Definition (8.1.3. or 8.1.4.):**

For calculating the number of cardiac arrests with **pre-sumed cardiac origin** excludes patient suffering cardiac arrest due to following causes

1. severe trauma
2. near drowning
3. hypoxia
4. intoxication
5. subarachnoidal haemorrhage
6. sudden infant death syndrome
7. haemorrhage
8. cerebral ischemia
9. metabolic disorders.

**Format:**

- a) Number
- b) Rate per 100,000 inhabitants
- c) Percentage [%]

**Source of Data:**

For almost all EMS systems these data are available directly from the data base of the EMS dispatch centre and / or from the compulsory documentation (run sheets) filled out by the EMS field crews for any emergency call.

**Up-Scaling:**

The indicator is available and meaningful on all scales reaching from the service area of one EMS station to the regional or national level (weighted means according to population).

**Rationale:**

Nearly 375,000 people in Europe suffer sudden cardiac arrest yearly. The incidence of starting CPR-efforts in different EMS-systems was reported to be 33 to 90 patients per 100,000 and year, which amounted up to 10% of all highest priority calls in some EMS-systems [4-6]. Therefore this indicator will provide information about the workload of the EMS providers.

Additionally, in a benchmarking process of different EMS-systems the calculation of resuscitation success rates is an accepted and powerful tool for comparison. Up to now the overall survival and recovery without residual neurologic damage after cardiac arrest with global cerebral ischemia is still rare [7]. There are many influencing factors determine the success of resuscitation efforts. One of the most important determinants is the time interval without therapy [4]. In the benchmarking process of EMS systems therefore the time to first shock should be calculated routinely in patient suffering from ventricular fibrillation as we have described above [8]. But other factors are predicting the resuscitation success as well. This are the comorbidity of the patient [9] and – which is important in our purpose – the organisation of the EMS system and the quality of resuscitation treatment delivered by the EMS-system [5, 10-16].

In the benchmarking process and quality management of EMS-systems, therefore, the calculation of resuscitation success rates is a well established measure. Since the "The Utstein style for uniform reporting of data from out-of-hospital cardiac arrest" was published in the year 1991 the times and time intervals as well as the templates how to calculate success rates are well defined [8].

To simplify this process in the EED benchmarking project we should only calculate the success rates for two sub-groups of all cardiac arrest cases –

1. "All patients with cardiac arrest of presumed cardiac aetiology"
2. "All patients with bystander witnessed (not EMS) cardiac arrest of presumed cardiac aetiology"

Within these subgroups the data should be differentiated by the first rhythm. Primary endpoints of survival rates should be the number of patients reaching the hospital with a pulse, number of patients which could be discharged from hospital and number of patients which could be discharged from hospital without major neurological deficit (Cerebral performance categories 1 or 2). These information's are the most meaningful ones in the benchmarking process of different EMS systems [5].

**Narrative:**

**Strengths:** These parameters of survival after cardiac arrest will give good information about the whole EMS process including access to the system, quality and speed of the dispatch, organisation of the vehicles and units and quality of care at scene and during transport.

**Limitations:** These indicators have to be compared and discussed with other parameters, because they are influenced by the whole process of EMS service. Because time without treatment after cardiac arrest is one of the limiting factors of resuscitation success it is undoubted that "time to first shock" and "response times" have to be considered when resuscitation success rates were compared and discussed.

**References:**

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2. Mosesso, V.N., Jr., et al., Use of automated external defibrillators by police officers for treatment of out-of-hospital cardiac arrest [In Process Citation]. *Ann Emerg Med*, 1998. **32**(2): p. 200-7.
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## 8.2 Severe Trauma Incidents

### **Name:**

Rate of severe trauma incidents

### **Nominal Definition:**

- a) Annual number of severe trauma incidents
- b) Annual rate of severe trauma incidents per 100,000 inhabitants
- c) Percentage of severe trauma incidents compared to all highest priority responses

Severe trauma incidents = cases with RTS  $\leq$  5

### **Operational Definition:**

- a) Annual number of severe trauma incidents
- b) Annual number of patients identified on scene as severe trauma cases divided by no. of inhabitants, multiplied by 100,000
- c) Annual number of patients identified on scene as severe trauma cases divided by the number of highest priority responses, multiplied by 100 [%]

Trauma caused by physical forces, including thermal lesions, disbaric lesion, electricity lesions, and near drowning (ICD 9 from 800-959.9).

### **Format:**

- a) Number
- b) Rate per 100,000 inhabitants
- c) Percentage [%]

### **Source of Data:**

System dataset generated from the run sheets or electronic format of clinical information from scene.

### **Upscaling:**

The indicator is available and meaningful on all scales reaching from the service area of one EMS station to the regional or national level (weighted means according to population).

### **Rationale:**

Treatment of trauma patients is one of the basic objectives of EMS. The severe injury patient is in a life-threatening situation in which time to stabilization and definitive care is basic for survival. The rapid provision of advanced techniques for stabilization and transport is one of the basic objectives of EMS. To adequate demand and resources to provided response to this condition is the fundament of EMS.

### **Narrative:**

Severe trauma is the leading cause of death in young groups of population. In a time-depended condition in which time to stabilization and to definitive care are the fundamental determinants of survival.

The golden hour classic concept emphasizes the importance of rapid on scene evaluation and stabilization of the vital lesion including airway management, respiratory support and circulation management of the possible problems, and rapid transport to definitive care.

Reduction in mortality for severe trauma has been demonstrated with a well established EMS integrated in trauma systems.

**Strengths:** Clearly defined clinical condition. All severe trauma cases access the health care system using the EMS.

**Limitations:** Less severe cases can access the health system without EMS intervention.

### **References:**

### 8.3 Severe breathing problems

**Name:**

Severe breathing problems

**Nominal Definition:**

- a) Annual number of severe breathing problems
- b) Annual rate of severe breathing problems per 100,000 inhabitants
- c) Percentage of severe breathing problems compared to all highest priority EMS responses

**Operational Definition:**

- a) Annual number of severe breathing problems
- b) Annual number of patients identified on scene as respiratory failure cases divided by no. of inhabitants, multiplied by 100,000
- c) Annual number of severe breathing problems divided by the number of all highest priority EMS responses, multiplied by 100 [%]

Defining respiratory failure as patients who are in clinical respiratory distress or have a respiratory rate >29 or <9 and who are hypoxic on examination and/or confirmed with pulseoximetry  $\leq 90\%$ .

All medical problems leading to respiratory failure.  
Exclude: trauma, foreign bodies, cardiac arrest.

**Format:**

- a) Number
- b) Rate per 100,000 inhabitants
- c) Percentage [%]

Specific for adults & children.

**Source of Data:**

System dataset generated from the run sheets or the electronic format of clinical information from scene.

**Upscaling:**

The indicator is available and meaningful on all scales reaching from the service area of one EMS station to the regional or national level (weighted means according to population).

**Rationale:**

Treatment of patients with respiratory failure is a time depended condition and is one of the basic objectives of EMS. The patient on respiratory failure is in a life-threatening situation in which time to stabilization and definitive care is basic for survival. The rapid provision of advanced techniques for stabilization and transport is one of the basic objectives of EMS. To adequate demand and resources to provided response to this condition is the fundament of EMS.

**Narrative:**

**Strengths:**

**Limitations:** Less severe cases can access the health system without EMS intervention. Difficulties in the identification of cases, diagnosis on scene can be complicated.

**References:**

## 8.4 Cardiac Chest Pain Incidents

### **Name:**

Cardiac chest pain incidents

### **Nominal Definition:**

- a) Annual number of cardiac chest pain incidents
- b) Annual rate of cardiac chest pain incidents per 100,000 inhabitants
- c) Percentage of cardiac chest pain incidents compared to all highest priority EMS responses

### **Operational Definition:**

- a) Annual number of cardiac chest pain incidents
- b) Annual number of cardiac chest pain incidents divided by no. of inhabitants, multiplied by 100,000.
- c) Annual number of cardiac chest pain incidents divided by the number of all highest priority EMS responses, multiplied by 100 [%]

Defining chest pain compatible ischaemic cardiac disease as cases with pain in the thorax, no previous trauma that is not modify by the respiratory movements.

### **Format:**

- a) Number
- b) Rate per 100,000 inhabitants
- c) Percentage [%]

### **Source of Data:**

System dataset generated from the run sheets or the electronic format of clinical information from scene.

### **Up-Scaling:**

The indicator is available and meaningful on all scales reaching from the service area of one EMS station to the regional or national level (weighted means according to population).

### **Rationale:**

Treatment of cardiovascular diseases and specifically acute coronary syndromes (ACS) is one of the basic objectives of EMS. Sudden cardiac death is part of ACS and the rapid provision of Advanced Cardiac Life Support is the only solution. To adequate demand and resources to provided response to this condition is the fundament of EMS.

### **Narrative:**

Cardiovascular diseases are the first cause of mortality in EU countries, 40% of all deaths are due to this problem with important variations in between countries, with a clear north-south gradient. Ischaemic cardiac diseases (ICD) are the leading cause of death in EU and half of them die suddenly. Sudden cardiac death (SCD) is considered as part of Acute Coronary Syndromes, in 19% of the cases SCD is the first manifestation of ICD.

Actually is recognized that more than 50% of AMI who die they do it in the pre-hospital setting and most of the time due to a ventricular fibrillation. The origin in Belfast of EMS was to treat patients with SCD providing for first time advanced cardiac care where the patient collapse. EMS with a rapid access to the victims and the possibility to offer a definitive treatment of the arrhythmia with defibrillation is the only solution for this condition. Actually well designed systems are capable to reanimate close to 50% of the cases with Ventricular Fibrillation, with a 10% survival after hospital discharge in good functional conditions.

**Strengths:** Clearly defined clinical condition. Usually quality control of management of cardiac arrest is part of the routine.

**Limitations:** Not all cases with ACS access EMS and it can be important differences in between systems. Some clinical difficulties in the differential diagnosis with other causes of chest pain.

### **References:**

Tunstall-Pedoe H, Kuulasmaa K, Mahonen M, Tolonen H, Ruokokoski E, Amouyel P. Contribution of trends in survival and coronary-event rates to changes in coronary heart disease mortality: 10-year results from 37 WHO MONICA project populations. Monitoring trends and determinants in cardiovascular disease. Lancet 1999 May 8;353(9164):1547-57

Kuller L, Lilienfeld A, Fisher R, Epidemiological study of sudden and unexpected deaths due to arteriosclerotic heart disease. Circulation 1966;34:1056-1068.

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## 8.5 Stroke incidents

### **Name:**

Stroke incidents

### **Nominal Definition:**

- a) Annual number of suspected stroke incidents
- b) Annual rate of suspected stroke incidents per 100,000 inhabitants
- c) Percentage of suspected stroke incidents compared to all highest priority EMS responses

### **Operational Definition:**

- a) Annual number of suspected stroke incidents
- b) Annual no. of suspected stroke incidents divided by no. of inhabitants, multiplied by 100,000.
- c) Annual number of suspected stroke incidents divided by the number of all highest priority EMS responses, multiplied by 100 [%]

Defining stroke incidents as patients with acute neurological deficit excluding those with previous injury, those with other medical conditions that can explain the clinical situation.

Include all coma (GCS  $\leq$  8) patients, but excluding trauma patients and other attributable causes.

### **Format:**

- a) Number
- b) Rate per 100,000 inhabitants
- c) Percentage [%]

### **Source of Data:**

System dataset generated from the run sheets or the electronic format of clinical information from scene.

### **Upscaling:**

The indicator is available and meaningful on all scales reaching from the service area of one EMS station to the regional or national level (weighted means according to population).

### **Rationale:**

Treatment of patients with stroke is a time depended condition and is one of the basic objectives of EMS. The patient with stroke is in a life-threatening situation or his final functional can be depended on time to stabilization and definitive care. The rapid provision of advanced techniques for stabilization and transport is one of the basic objectives of EMS. To adequate demand and resources to provided response to this condition is the fundament of EMS.

### **Narrative:**

Stroke constitutes the 3<sup>rd</sup> leading cause of death in EU and more than 1 million new cases, occur every year producing 400,000 casualties.

Is not only the high mortality but the number of case with disability in those who survive. Cerebrovascular diseases are de first cause for disability in European countries. This disease produces a high cost on health systems and is estimated that accounts 3-5% of total health cost.

### **Strength:**

**Limitations:** Less severe cases can access the health system without EMS intervention. Difficulties in the identification of cases, diagnosis on scene can be complicated.

### **References:**

**9 Patients with Initial GCS ≤ 8**

**Name:**

Patients with initial GCS ≤ 8

**Nominal Definition:**

Patients (cases that generated a record) with initial GCS ≤ 8.

**Operational Definition:**

- a) Annual number of patients with initial GCS ≤ 8
- b) Annual no. patients with initial GCS ≤ 8 divided by no. of inhabitants, multiplied by 100,000.
- c) Annual number of patients with initial GCS ≤ 8 divided by the number of all highest priority EMS responses, multiplied by 100 [%]

**Rationale:**

GCS is used to evaluate cerebral performance with an objective tool, although his initial development was for head trauma patients, actually widely used for the clinical evaluation of more general medical problems, like cerebrovascular accidents, central nervous infections, poisoning, and metabolic conditions, or the cardiac arrest patient. GCS rank from 15 to 3, with 15 being the better situation, 8 as a cutting point comes from the initial classification of head trauma:

- Severe Head Injury                      GCS score of 8 or less
- Moderate Head Injury                      GCS score of 9 to 12
- Mild Head Injury                              GCS score of 13 to 15

Include all coma (GCS ≤ 8) patients, but excluding trauma patients and other attributable causes.

**Format:**

- a) Number
- b) Rate per 100,000 inhabitants
- c) Percentage [%]

**Source of Data:**

System dataset generated from the run sheets or the electronic format of clinical information from scene.

**Upscaling:**

Indicator can be used in any scale frame.

Also for medical problems has been adopted as a severity cutting point, those patients with GCS 3-8 are by definition in coma.

**Narrative:**

Glasgow Coma Scale (GCS) is a numeric rating used to evaluate the neurologic damage. The scale includes evaluation of level of consciousness, and motor activity in response to stimuli.

The scale is obtained by the adding his three different components:

- Eye opening response
- Best verbal response
- Best motor response

**Figure 2: GCS Calculation**

	Adult	Infant(*0-2)	Points
<b>Eye Opening Response</b>	Spontaneous--open with blinking at baseline	Spontaneously	4
	Opens to verbal command, speech, or shout	To command	3
	Opens to pain, not applied to face	To pain	2
	None	None	1
<b>Verbal Response</b>	Oriented	Apropiaded words *Coos or babbles, smiles	5
	Confused conversation, but able to answer questions	Inapropiated words *Irritable cries	4
	Inappropriate responses, words discernible	Cries *Cries to pain	3
	Incomprehensible speech	Grunts *Moans to pain	2
	None	None	1
	<b>Motor Response</b>	Obeys commands for movement	Moves spontaneous/purposefully
Purposeful movement to painful stimulus		Withdraws to touch	5
Withdraws from pain		Withdraws to pain	4
Abnormal (spastic) flexion, decorticate posture		Decorticate	3
Extensor (rigid) response, decerebrate posture		Decerebrate	2
None		None	1

The scale was designed to reduce observer variability, to give comparison between different patients and their management, and to assist the judgement of prognosis. Actually the score is also part of other severity scores (RTS, MEES, APACHE, TRISS), and is used as a predictive indicator of outcome.

GCS is an indicator of interventions and it is assumed that patients with GCS  $\leq 8$  have airway obstruction due to decrease level of consciousness, and intubation is indicated in this cases. Those the number of patients with GCS  $\leq 8$  intubated is a quality indicator.

Comparing rentability of GCS with other predictive scores like APACHE and MEES there is no statistical difference in predicting hospital mortality.

**Strengths:** Widely used, used alone or as part of other severity score. GCS is a standard evaluation procedure in all clinical records. Low interobserver variability if training is provided.

**Limitations:** Sedation of patients limits the evaluation. Intubation can also limit the use of the score, GCS is evaluated prior to the intubation. Language barriers can limit the use. Facial trauma. Age limitation have been solved using special adaptation or infants and babies for verbal response. Training in the evaluation of patients is necessary to be accurate in the measurements.

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## 10 Trauma Patients with Initial GCS ≤ 8

### **Name:**

Trauma patients with initial GCS ≤ 8

### **Nominal Definition:**

Trauma patients (cases that generated a record) with initial GCS ≤ 8.

### **Operational Definition:**

- Annual number of trauma patients with initial GCS ≤ 8
- Annual no. of trauma patients with initial GCS ≤ 8 divided by no. of inhabitants, multiplied by 100,000.
- Annual number of trauma patients with initial GCS ≤ 8 divided by the number of all highest priority EMS responses, multiplied by 100 [%]

Include all coma (GCS ≤ 8) patients with trauma

### **Format:**

- Number
- Rate per 100,000 inhabitants
- Percentage [%]

### **Source of Data:**

System dataset generated from the run sheets or the electronic format of clinical information from scene.

### **Upscaling:**

Indicator can be used in any scale frame.

### **Rationale:**

The scale was designed to reduce observer variability, to give comparison between different patients and their management, and to assist the judgement of prognosis. Actually the score is also part of other severity scores (RTS, MEES, APACHE, TRISS), and is used as a predictive indicator of outcome.

GCS is an indicator of interventions and it is assumed that patients with GCS≤8 have airway obstruction due to decrease level of consciousness, and intubation is indicated in this cases. Those the number of patients with GCS ≤ 8 is a quality indicator.

The score is used to select final destination of patients that need neurosurgery services.

**Strengths:** Widely used, used alone or as part of other severity score. GCS is a standard evaluation procedure in all clinical records. Low interobserver variability if train is provide.

### **Limitations:**

Sedation of patients limits the evaluation. Intubation can also limit the use of the score, GCS is evaluated previous to the intubation. Language barriers can limit the use. Facial trauma. Age limitation have been solved using special adaptation or infants and babies for verbal response.

GCS is used to evaluate cerebral performance with an objective tool, although his initial development was for head trauma patients, actually widely used for the clinical evaluation of more general medical problems like cerebrovascular accidents, central nervous infections, poisoning, and metabolic conditions, or the cardiac arrest patient. GCS rank from 15 to 3, with 15 being the better situation, 8 as a cutting point comes from the initial classification of head trauma:

- Severe Head Injury  
GCS score of 8 or less
- Moderate Head Injury  
GCS score of 9 to 12
- Mild Head Injury  
GCS score of 13 to 15

The patients with GCS≤ 8 correspond to patients with severe head injury, or decrease level of consciousness due to respiratory or circulatory problems.

### **Narrative:**

Glasgow Coma Scale (GCS) is a numeric rating used to evaluate the neurologic damage. The scale includes evaluation of level of consciousness, and motor activity in response to stimuli.

The scale is obtained by the adding his three different components:

- Eye opening response
- Best verbal response
- Best motor response

Training in the evaluation of patients is necessary to be accurate in the measurements.

### **References:**

Teasdale G, Jennet B: Assessment of coma and impaired consciousness: a practical scale, *Lancet* 1974; 2:81-84.  
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## 11 Trauma Patients with RTS ≤ 5

### **Name:**

Trauma patients with RTS ≤ 5

### **Nominal Definition:**

Number, rates and percentage of the treated trauma patients (ICD 800-959.9) with initial RTS ≤ 5

### **Operational Definition:**

- Annual number of treated trauma patients with a RTS ≤ 5
- Annual number of treated trauma patients with a RTS ≤ 5 divided per total number of trauma patients, multiplied by 100.
- Annual number of treated trauma patients with a RTS ≤ 5 divided by the number of all highest priority EMS responses, multiplied by 100 [%]

### **Format:**

- Number
- Rate per 100,000 inhabitants
- Percentage [%]

### **Source of Data:**

System dataset generated from the run sheets or the electronic format of clinical information from scene.

### **Upscaling:**

Indicator can be used in any scale frame.

### **Rationale:**

The Revised Trauma Score (RTS) is a physiological scoring system. It is scored from the first set of data obtained on the patient, using Glasgow Coma Scale, systolic blood pressure and respiratory rate. Ranks from 0 to 7.84, with 0 being the worst condition.

RTS is the standard score to evaluate initial severity of trauma patient, correlates with survival and is used to triage severe cases to level I centres or to use special transport systems.

The cutting point of 5 is reached by consensus accepted as the level that identifies severe cases, with a survival probability under 80%.

RTS includes only physiopathologic variables, so final diagnosis is not necessary for the calculation and this makes the score suitable for pre-hospital setting, and it has become the standard for trauma patients severity scoring.

### **Narrative:**

RTS comes from a modification of the Trauma Score (TS), a severity score for trauma patients developed for use in the pre-hospital setting, modification included the elimination of from the calculation of capillary refill and respiratory expansion, which were difficult to assess. RTS was designed as predictive multivariable model of survival for trauma patients, with better predict power for survival than TS. RTS is a weighted sum of coded variable values, the scale only includes evaluation of Glasgow Coma Scale, systolic blood pressure and respiratory rate. Calculation is done applying the following weights to the predictive model.

**Figure 3: RTS calculation**

Glasgow Coma Scale GCS	Systolic Blood Pressure SBP	Respiratory Rate RR	Points
13-15	>89	10-29	4
9-12	76-88	>29	3
6-8	50-75	6-9	2
4-5	1-49	1-5	1
3	0	0	0

$$RTS = 0.9368 \text{ GCS} + 0.7326 \text{ SBP} + 0.2908 \text{ RR}$$

The value ranks from 0 to 7.84 and GCS has the greatest weight in the formula while RR has the lowest.

RTS correlates well with survival, and for different values we can see that patients with RTS > 5 the probability of survival is over 90%.

It has been demonstrated a good correlation with Injury Severity Score, a score in which the anatomical lesions are included, demonstrating that RTS was able to identify all severe cases using only physiological variables.

RTS has been used extensively like in the "Major Trauma Outcome Study" to evaluate differences between predicted and observed outcomes, not used as a quality control tool in trauma systems.

Revised Trauma Score	Survival
0	0.027
1	0.071
2	0.17
3	0.36
4	0.60
5	0.80
6	0.91
7	0.96
7.8	0.98

RTS has been validated in European countries and it has been found useful for pre-hospital triage.



**Strengths:** Widely used, good correlation with other trauma scores. Low interobserver variability if training is provided. Good correlation with other scores that use anatomical diagnosis.

**Limitations:** Performance of RTS in comparison with other trauma scores has limitation. Performance of the score is not so good in all types of trauma with some differences between blunt and penetrating injuries.

**References:**

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Murphy JG, Cayten CG, Stahl WM. Controlling for the severity of injuries in emergency medicine research. *Am J Emerg Med*. 1990 Nov;8(6):484-91.

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## 11.1 Traffic Injuries

### **Name:**

Traffic injuries

### **Nominal Definition:**

- a) Annual number of traffic injuries
- b) Annual rate of traffic injuries per 100,000 inhabitants
- c) Percentage of traffic injuries compared to all highest priority EMS responses

### **Operational Definition:**

- a) Annual no. of traffic injuries
- b) Annual no. of traffic injuries divided by no. of inhabitants, multiplied by 100,000
- c) Annual number of traffic injuries divided by the number of all highest priority EMS responses, multiplied by 100 [%]

Defining traffic accidents as patients that were injured by any type of ground vehicle on a space regulated by traffic laws.

### **Format:**

- a) Number
- b) Rate per 100,000 inhabitants
- c) Percentage [%]

### **Source of Data:**

System dataset generated from the run sheets or the electronic format of clinical information from scene.

### **Up-Scaling:**

### **Rationale:**

### **Narrative:**

### **Strengths:**

### **Limitations:**

### **References:**

## 12.1 Patients with Assisted Ventilations

### **Name:**

Patients with assisted ventilations

### **Nominal Definition:**

- a) Annual number of patients receiving assisted ventilations (including "mouth to mouth" and mechanical ventilation).
- b) Annual number of patients receiving assisted ventilations per 100,000 inhabitants
- c) Percentage of number of patients receiving assisted ventilations to all highest priority EMS responses

### **Operational Definition:**

- a) Annual no. of patients receiving assisted ventilations
- b) Annual no. of patients receiving assisted ventilations divided by no. of inhabitants, multiplied by 100,000
- c) Annual number patients receiving assisted ventilations divided by the number of all highest priority EMS responses, multiplied by 100 [%]

### **Format:**

- a) Number
- b) Rate per 100,000 inhabitants
- c) Percentage [%]

### **Source of Data:**

Data is available from the patient documentation forms (run sheets) filled out by the EMS field crew for ALS.

### **Upscaling:**

The indicator is available and meaningful on all scales reaching from the service area of one EMS station to the regional or national level.

### **Rationale:**

This indicator measures the work load of the EMS system. Furthermore, it is a simplified indicator for the level of care provided.

### **Narrative:**

All patients with a decreased or reduced respiratory rate or tidal volume require to be ventilated in order to maintain minute volume (minute volume = the amount of air moved in and out of the lungs in 1 minute). (Respiratory rate 12 multiplied by tidal volume approximately 500 ml = 5252 litres per minute). In the event that this equation falls, the patient will quickly become hypoxic (lacking in oxygen) and vital organs will be damaged.

**Strengths:** Data for this indicator is easy to collect and provides a first indication for the level of care of the EMS system.

**Limitations:** This is just a simplified indicator for the level of care or quality of care. As a second step, it should be analysed if the intervention was appropriate and carried out correctly. Overtreatment and undertreatment should be analysed. Another limitation for comparability of this indicator is the underlying health status of the population served.

### **References:**

## 12.2 Intubated Patients

### **Name:**

Intubated Patients

### **Nominal Definition:**

Percentage of patients either receiving intubations or on whom an intubation has been attempted

### **Operational Definition:**

- a) Annual no. of patients receiving intubations or on whom an intubation has been attempted
- b) Annual no. of patients receiving intubations or on whom an intubation has been attempted divided by no. of inhabitants, multiplied by 100,000
- c) Annual no. of patients receiving intubations or on whom an intubation has been attempted divided by all patients receiving ALS treatment, multiplied by 100 [%]

### **Format:**

- a) Number
- b) Rate per 100,000 inhabitants
- c) Percentage [%]

### **Source of Data:**

Data is available from the patient documentation forms (run sheets) filled out by the EMS field crew for ALS.

### **Upscaling:**

The indicator is available and meaningful on all scales reaching from the service area of one EMS station to the regional or national level.

### **Rationale:**

This indicator measures the work load of the EMS system. Furthermore, it is a simplified indicator for the level of care provided.

Intubation in critical patients (including surgical airways) is an important measurement of resuscitation and skill.

### **Narrative:**

The majority of patients with a reduced level of consciousness require the airway to be secured by the use of an endotracheal tube. The use of an endotracheal tube will prevent gastric contents soiling the airway, resulting in aspiration pneumonia.

**Strengths:** Data for this indicator is easy to collect and provides an first indication for the level of care of the EMS system.

**Limitations:** This is just a simplified indicator for the level of care or quality of care. As a second step, it should be analysed if the intervention was appropriate and carried out correctly. Overtreatment and undertreatment should be analysed. Another limitation for comparability of this indicator is the underlying health status of the population served.

### **References:**

## 12.3 Patients receiving i.v. drug administration (without fluids)

### **Name:**

Patients receiving i.v. drug administration

### **Nominal Definition:**

Patients receiving i.v. drug administration (without fluids) for whom ALS treatment may be indicated.

### **Operational Definition:**

- a) Annual no. of patients receiving i.v. drug administration (without fluids)
- b) Annual no. of patients receiving i.v. drug administration (without fluids) divided by no. of inhabitants, multiplied by 100,000
- c) Annual no. of patients receiving i.v. drug administration (without fluids) divided by all patients receiving ALS treatment, multiplied by 100 [%]

### **Format:**

- a) Number
- b) Rate per 100,000 inhabitants
- c) Percentage [%]

### **Upscaling:**

The indicator is available and meaningful on all scales reaching from the service area of one EMS station to the regional or national level.

### **Rationale:**

This indicator measures the work load of the EMS system. Furthermore, it is a simplified indicator for the level of care provided.

It is important to keep an ongoing record of drugs administered to patients to establish the number of patients treated and the appropriateness of treatment.

In cardiac arrests and other critical patients IV drug administration is the preferred route as the drug carried in the blood stream is a catecholamine and will be carried to the target organ rapidly

### **Narrative:**

Measurements should be made before and after drug administration to establish the efficacy of such administration. Measurement parameters considered should include peak flow, respiratory rate, pulse, LOC etc.

**Strength:** Data for this indicator is easy to collect and provides a first indication for the level of care of the EMS system.

**Limitations:** This is just a simplified indicator for the level of care or quality of care. As a second step, it should be analysed if the intervention was appropriate and carried out correctly. Overtreatment and undertreatment should be analysed. Another limitation for comparability of this indicator is the underlying health status of the population served.

### **References:**

**Appendix 7:  
First Hour Quintet**

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	ICD10	ICD9
<b>Trauma</b> Only cases with RTS ≤ 5		800 to 959.9
Craniocerebral trauma	S06.9	
Traumatic haemopneumothorax	S27.2	
Injury of thorax	S29.9	
Injury of spleen	S36	
Injury of liver	S36.1	
Injury of other intraabdominal organs	S36.8	
Injury of kidney	S37.0	
Injuries of shoulder and upper arm	S49	
Injuries of forearm	S59	
Injuries of wrist and hand	S69	
Injuries of hip and thigh	S79	
Injuries of knee and lower leg	S89	
Injuries of ankle and foot	S99	
Polytrauma	T07	
Fracture of spine	T08	
Fracture, unspecified	T14.2	
Traumatic shock	T79.4	

**Table 10: Trauma incidences (ICD 9 & 10) included in the First Hour Quintet**

<b>Respiratory Failure</b>	ICD10	ICD9
Pulmonary embolism	I26	415.1
Heart failure	I50	428 (needs to be expanded)
Congestive heart failure	I50.0	428
Left ventricular failure	I50.1	428.1
Acute obstructive laryngitis [croup] and epiglottitis	J05	464
Bacterial pneumonia, not elsewhere classified	J15	485 486
Acute bronchiolitis	J21	466
Viral pneumonia, unspecified	J12.9	480.9
Bronchitis, not specified as acute or chronic	J40X	490
Unspecified chronic bronchitis	J42X	496
Asthma	J45	493 (needs to be expanded)
Adult respiratory distress syndrome	J80.X	
Pulmonary oedema	J81.X	514
Pneumothorax	J93	512 (needs to be expanded)
Respiratory failure, not elsewhere classified	J96	518
Acute respiratory failure	J96.0	518
Chronic respiratory failure	J96.1	518.83
Respiratory failure, unspecified	J96.9	518.84
Dyspnoea	R06.0	786.09
Respiratory failure, respiratory arrest	R09.2	799.1

**Table 11: Respiratory failure incidences (ICD 9 & 10) included in the First Hour Quintet**

Stroke or suspected cerebrovascular events	ICD10	ICD9
Subarachnoid haemorrhage	I60	430
Intracerebral haemorrhage	I61	431 432
Nontraumatic extradural haemorrhage	I62.1	432.0
Intracranial haemorrhage (nontraumatic), unspecified	I62.9	432.9
Cerebral infarction	I63	434 (needs to be expanded)
Stroke, not specified as haemorrhage or infarction	I64.X	436
Transient cerebral ischaemic attacks and related syndromes	G45	435

**Table 12: Stroke incidences (ICD 9 & 10) included in the First Hour Quintet**

Cardiac Chest Pain	ICD10	ICD9
Angina pectoris	I20	413 (needs to be expanded)
Unstable angina	I20.0	
Angina pectoris with documented spasm	I20.1	
Other forms of angina pectoris	I20.8	414
Angina pectoris, unspecified	I20.9	
Acute myocardial infarction	I21	410
Certain current complication follow acute myocardial infarct	I23	
Acute ischaemic heart disease, unspecified	I24.9	411

**Table 13: Cardiac chest pain incidences (ICD 9 & 10) included in the First Hour Quintet**

Cardiac Arrest	ICD10	ICD9
Cardiac arrest	I46	427.5
Cardiac arrest with successful resuscitation	I46.0	
Sudden cardiac death, so described	I46.1	798.1, 427.5
Cardiac arrest, unspecified	I46.9	427.5
Unattended death	R98.X	798.9
Sudden Infant death syndrome	R95.X	798.0
Instantaneous death	R96.0	798.1
Death occurring in less than 24 hours from onset	R96.1	798.2
VF	I49.0	

**Table 14: Cardiac Arrest incidences (ICD 9 & 10) included in the First Hour Quintet**

**Appendix 8:  
Workshops**

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	<b>Aim</b>	<b>Main results</b>
<b>Workshop 1</b> in Bonn, Germany (Nov. 1-2, 2002)	Identifying common EMS system components	<ul style="list-style-type: none"> <li>▪ Presentations of all participating EMS systems</li> <li>▪ Overview on different system designs including strengths and limitations</li> <li>▪ Template "Patient Journey"</li> </ul>
<b>Workshop 2</b> in Santillana del Mar, Spain (Jan. 23-24, 2003)	Agreement on list of common variables which are provided as a standard routine by each system	<ul style="list-style-type: none"> <li>▪ Synopsis on available data</li> <li>▪ Overview on selected variables useful for Public Health Monitoring (regarding access to the system, operational markers and clinical markers)</li> </ul>
<b>Workshop 3</b> in Garches, France (April 3-4, 2003)	Draft list of EMS indicators that are relevant for health monitoring	<ul style="list-style-type: none"> <li>▪ First draft of definitions of indicators for health monitoring based on EMS data</li> </ul>
<b>Workshop 4</b> in Helsinki, Finland (June 26-27, 2003)	Developing procedures for future data collection, validation and analysis	<ul style="list-style-type: none"> <li>▪ Synopsis on staffing</li> <li>▪ Second draft of definition of indicators</li> </ul>
<b>Workshop 5</b> in Galway, Ireland (Oct. 2-3, 2003)	Final list of EMS indicators for health monitoring that includes a methodology for collection and analysis	<ul style="list-style-type: none"> <li>▪ First draft of the rationales including amendments from the group</li> </ul>
<b>Workshop 6</b> in Kramsach, Austria (Jan. 22-23, 2004)	Final agreement on list of indicators and a methodology for collection and analysis	<ul style="list-style-type: none"> <li>▪ Results of the pilot data collection</li> <li>▪ Master list of indicators</li> <li>▪ Final version of the rationales</li> </ul>

**Table 15: Aims and results of the EED workshops**



**Appendix 9:  
Dissemination**

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Name of the conference	Target group	Town / Country	Date	Contribution
13 <sup>th</sup> World Congress on Disaster and Emergency Medicine	A	Melbourne / Australia	May 6 <sup>th</sup> – 10 <sup>th</sup> , 2003	The Impact of Emergency Medical System Design on the Performance of Response and Treatment for Disaster Patients
10 <sup>th</sup> International Medical Geography Symposium	A	Manchester / UK	July 14 <sup>th</sup> – 18 <sup>th</sup> , 2003	European Emergency Data Project – an EMS Data-based Health Surveillance System
NATO Medical Conference	A+B	Ljubljana / Slovenia	September 1 <sup>st</sup> – 4 <sup>th</sup> , 2003	Benchmarking EMS Systems: A Contribution to a Comprehensive Public Health Monitoring System
Annual Meeting 2004 of the National Association of EMS Physicians	A+B	Tuscon / USA	January 8 <sup>th</sup> - 10 <sup>th</sup> , 2004	EMS System Benchmarking: The Truth Partly Told.
16 <sup>th</sup> National Congress of the Sociedad Española de Medicina de Urgencias y de Emergencias	A+B	Marbella / Spain	June 2 <sup>nd</sup> – 5 <sup>th</sup> , 2004	Es posible la comparación de los sistemas de emergencias entre los países de la Union Europea "European Emergency Data Project" Relacion entre resultados y recursos de la asistencia a las emergencias. "European Emergency Data Project"
German Congress of Anaesthesiology (Deutscher Anästhesiecongress (DAC))	B	Nürnberg / Germany	June 19 <sup>th</sup> - 22 <sup>nd</sup> , 2004	Qualitätsmanagement im Rettungsdienst Wie ist Qualität messbar und welche Zahlen sind zum Benchmarking geeignet?
AMBEX	B+C	Harrogate / UK	July 2 <sup>nd</sup> – 3 <sup>rd</sup> , 2004	European Emergency Data Project – an EMS Data-based Health Surveillance System

**Table 16: Oral presentations of (interim) results in the past**

Name of the conference	Target group	Town / Country	Date	Contribution
DIVI – German Emergency Medicine Congress	B+C	Hamburg/Germany	November, 13 <sup>th</sup> – 16 <sup>th</sup> , 2002	Das Notarzteinsetzprotokoll in der kommunalen Gesundheitsberichterstattung
Annual meeting of the Deutsche Gesellschaft für Sozialmedizin und Prävention (DGSMP 2003)	B+C	Greifswald / Germany	September 24 <sup>th</sup> – 26 <sup>th</sup> , 2003	Gesundheitsberichterstattung für den Bereich Notfallrettung – aktuelle Ergebnisse aus dem European Emergency Data Project
2 <sup>nd</sup> Mediterranean Emergency Medicine Congress	A+B	Sitges / Spain	Sept 13 <sup>th</sup> – 17 <sup>th</sup> , 2003	Benchmarking EMS Systems: a Contribution to a Comprehensive Public Health Monitoring System - A Working Report on the European Emergency Data Project

**Table 17: Poster presentations of (interim) results in the past**

Name of the conference	Target group	Town / Country	Date	Status
7 <sup>th</sup> Scientific Congress of the European Resuscitation Council	A+B	Budapest, Hungary	September 8 <sup>th</sup> – 11 <sup>th</sup> , 2004	3 papers accepted for oral presentation, 1 poster accepted
Trauma Care 2004	A+B	Sydney	October, 15 <sup>th</sup> – 17 <sup>th</sup> , 2004	1 paper accepted for oral presentation
Danish Society of Anaesthesiology	B	Copenhagen, Denmark	November 4 <sup>th</sup> -6 <sup>th</sup> , 2004	3 papers accepted for oral presentation
DIVI – German Emergency Medicine Congress	B+C	Hamburg / Germany	December 1 <sup>st</sup> – 4 <sup>th</sup> , 2004	1 paper accepted for poster presentation
3 <sup>rd</sup> European Congress on Emergency Medicine	A+B+C	Leuven / Belgium	February 9 <sup>th</sup> – 13 <sup>th</sup> , 2005	Key note accepted and 4 papers accepted for oral presentation
1 <sup>st</sup> Hesculaep Conference	A+B+C	Paris/France	March 14 <sup>th</sup> – 15 <sup>th</sup> , 2005	Participation accepted; confirmation of titles pending
14 <sup>th</sup> World Congress on Disaster Medicine	A	Edinburgh / UK	May 16 <sup>th</sup> – 20 <sup>th</sup> , 2005	Papers to be submitted
3 <sup>rd</sup> Mediterranean Emergency Medicine Congress	A+B	Nice /France	Sept 2 <sup>nd</sup> -5 <sup>th</sup> , 2005	Papers to be submitted; special session applied for
BASIC Conference (British Association for Immediate Care)	B	United Kingdom	October 16 <sup>th</sup> – 17 <sup>th</sup> , 2005	Paper to be submitted

**Table 18: Planned presentations at international and national conferences**

Name of the journal	Target group	Issue	Title
Intensivmedizin und Notfallmedizin	B+C	2002, 39 (Suppl 1): i62	Das Notarzteinsetzprotokoll in der kommunalen Gesundheitsberichterstattung
Ambulance Today	C	2002, 2(2):31-34	European Emergency Data Project
Anästhesiologie, Intensivmedizin, Notfallmedizin und Schmerztherapie	B+C	2003, 38: 630-642	Effektivitäts- und Effizienzvergleich der Rettungsdienstsysteme in Birmingham (UK) und Bonn (D)
European Journal of Public Health	A+B	2003, 12 (3 Supplement):85-90	European Emergency Data Project (EED Project) – EMS data-based Health Surveillance System
Resuscitation	A+B	2004, 62(3):325	EMS Data based Health Surveillance-Integrating Pre-Hospital Care Information into the EU's Health Monitoring Programme
Resuscitation	A+B	2004, 62(3):324	Benchmarking EMS in Europe
Resuscitation	A+B	2004, 62(3):325	First Hour Quintet Along EMS in Europe

**Table 19: Publications in journals**

Name of the journal	Target group	Working title	Status
Intensivmedizin und Notfallmedizin	B+C	Rettungsdienst-basierte Indikatoren in der Europäischen Gesundheitsberichterstattung	accepted
Prehospital and Disaster Medicine (NAEMSP)	A+B	Benchmarking EMS	Paper to be submitted
EJ Health Economics	A+B	EMS System Design & Benchmarking	Paper to be submitted
British Medical Journal (or English Medical Journal)	A+B	Health Indicators from EMS data	Paper to be submitted
Resuscitation	A+B	First Hour Quintet - Translation into reality & use for system comparison	Paper to be submitted
Resuscitation	A+B	Template for EMS description	Paper to be submitted

**Table 20: Planned publications in journals**

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