Emergency Medical Services (EMS) constitute a unique component of health care at the interface between primary and hospital care. EMS data within the pre-hospital setting represents an unparalleled source of epidemiological and health care information that has so far been neglected for public health monitoring. The European Emergency Data Project (EED Project) thus intends to identify common indicators for European EMS systems and to evaluate their suitability for integration into a comprehensive public health monitoring strategy. The following is a brief overview of objectives and methodology in the form of a progress report.

Keywords: Emergency Medical Services (EMS), health monitoring, European perspective, indicators

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Patients access EMS systems through a variety of different mechanisms. Throughout Europe, EMS data is recorded continuously including information about the patient's main complaints, age and sex, and the geographic location of emergency sites. Therefore, EMS data provide unique and highly valuable information for public health monitoring. Typical emergency patients are those suffering from cardiac arrest, respiratory failure, trauma, acute coronary syndromes or stroke. These five critical conditions - defined as the 'first hour quintet' - were highlighted during the last European Resuscitation Congress held in Florence in October 2002. They are both life-threatening and economically important. It is these critical conditions in the 'first hour quintet' for which pre-hospital emergency care can have the most valuable impact.

COMPARING EMS SYSTEMS

Despite the strong potential of EMS data as a reliable source for public health monitoring, the development of EMS historically has been driven by localised forces, creating difficulties when it comes to comparing systems and developing common indicators for health monitoring and benchmarking. The result has been that there are different types of EMS systems and numerous varieties of those types. Traditionally, EMS was not considered as a part of the health care delivery system. EMS evolved from the need to transport a patient from a scene, initially during military conflicts, to a physician who could provide definitive care. Over time, individual communities developed modes of transport that best met the needs of that community, based on human factors, including culture, existing health care resources, and finance. The recognition that transport could actually have an impact on patient outcome, and that it was a part of a 'system' was not recognised until the 1960s, long after the ambulance transport was an established part of the communities' infrastructure. The direct result is the diversity of EMS systems found internationally. Some systems are based on the provision of pre-hospital care by non-physicians (emergency medical technicians and paramedics), others are built around the central role of emergency physicians, attending emergency patients. Accordingly, some EMS systems tend to provide as much care as possible at the scene of the emergency whereas others try to minimise the on-scene and transport time. It is well documented that the timeliness and the quality of care provided by the EMS system has a significant influence on patient outcome. For example, differences in survival after out-of-hospital cardiac arrest across
Europe may be explained by medical performance or system design. The provision of care ranges from Basic Life Support by volunteers to full Advanced Life Support by emergency physicians. These differences have a significant impact on health outcomes, but also on resource utilisation (e.g. hospital admission rates, length of stay). However, only a few studies have attempted to systematically address this problem so far. In North America, initial benchmarking studies have been undertaken to compare the clinical and economical performance of its EMS systems. Though only focused on comparable North American EMS systems, these studies laid the methodological ground for further studies linking medical outcome and economic performance.

A first attempt systematically to compare the clinical and economic performance of different EMS systems in Europe was a project comparing systems in Santander (Spain), Bonn (Germany) and Birmingham (UK). The study was based on a comprehensive framework for system analysis (figure 1) using standardised scores and measurements such as the ICD coding system, the Glasgow Coma Scale (GCS), the Mainz Emergency Evaluation Score (MEES) and outcome scores. Based on these variables it was possible to evaluate clinical and economic performance.

The study showed that international comparison and benchmarking of different EMS systems is possible and useful. The results also highlighted the relevance of emergency data for public health monitoring (cf. map 1) and for analysing socio-demographic and socio-economic determinants on health care utilisation.

These results form the scientific basis for the ongoing European Emergency Data project which focuses mainly on the following two questions: which EMS indicators are relevant for health monitoring and benchmarking; and which of these indicators are ubiquitously available across Europe? To answer these questions, the project had to be extended on a larger scale. The extended EED project started in October 2002 with 13 research partners: 12 European partners and one associated partner from Virginia, USA.

**OBJECTIVES**

The main objective of the European Emergency Data project is to identify common components and create a common framework for monitoring and assessing EMS systems throughout the European Union as an integrated part of a health monitoring strategy. This will eventually lead to the development of crucial indicators from evidence-based data to allow further comparisons among different Member States. The project will provide a comprehensive list of indicators based on the collection of EMS data that will enable the monitoring, evaluation and comparison of the respective activities of the Member States in the area of pre-hospital emergency care. As part of this goal, EMS data will be analysed to identify whether it can provide necessary information on the temporal and geographical distribution of injuries and critical medical conditions.

**METHODS**

The project comprises a research network of 12 European high performance EMS systems representing the different system designs in Europe. The participating partners are listed in table 1.

The project is organised around a series of 6 international expert workshops. These workshops create a forum for the presentation and joint analysis of the information and data provided by each system. The workshops are crucial for agreeing on standard definitions and common terminologies. Between workshops, all partners are requested to prepare and provide additional information and data that will be processed by the coordination office at the University of Munich as preparation for the following workshop. As a first step, common EMS system components have been identified providing a sound framework for further collaboration. Currently, all partners are reviewing their standard documentation for pre-hospital care. This includes all patient records and field reports.
The uninhabited census tracts are excluded from spatial analysis.

Data base:
Emergency physician
(ALS) run sheets 2001 of the City of Bonn and Bundesstadt Bonn (Ed.): Sozialatlas der Bundesstadt Bonn 2001.
Map base:
NAVTEC Geodaten 2000.
Source: (8)

ICD 10 Group Diagnoses

Map 1 Diseases diagnosed by emergency physician in Bonn 2001 (ICD-10)
Figure 2 Result of the first workshop: the 'Patient Journey' template

('runsheets') as well as any other data and information on access to the EMS system or on operational and clinical key indicators. From this broad list of available data, a synopsis will be developed and common variables will be identified. In a further step, a first draft list of possible EMS indicators relevant for health monitoring will be drafted. Standardised definitions and current procedures of data collection, validation and analysis will be added, followed by a comprehensive re-assessment of the list of indicators based on the identification of possible pathways for integration into a European Health Monitoring System.

Table 1 The European Emergency Data Network

<table>
<thead>
<tr>
<th>Organization/Location</th>
<th>Country</th>
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</thead>
<tbody>
<tr>
<td>Österreichisches Rotes Kreuz, Rettungsleistelle Tirol</td>
<td>Austria</td>
</tr>
<tr>
<td>Ministry of Social Affairs, Public Health and Environment (Belgian Board of Emergency Physicians for Quality Improvement) and University Hospital Gaestehuis</td>
<td>Belgium</td>
</tr>
<tr>
<td>Københavens Brandvaesen and Copenhagen University Hospital, Trauma Centre &amp; Emergency Department</td>
<td>Denmark</td>
</tr>
<tr>
<td>University of Cantabria, Departamento de Ciencias Medicas y Quirurgicas, Facultad de Medicina</td>
<td>Spain</td>
</tr>
<tr>
<td>Feuerwehr der Stadt Bonn und Klinik und Poliklinik für Anaesthesiologie und Spezielle Intensivmedizin der Universität Bonn</td>
<td>Germany</td>
</tr>
<tr>
<td>Helsinki Area HEMS / Medi-Heli</td>
<td>Finland</td>
</tr>
<tr>
<td>SAMU de Hauts de Seine</td>
<td>France</td>
</tr>
<tr>
<td>Western Health Board, Ambulance Service H. Q. Servicio 118 Genova Soccorso</td>
<td>Ireland</td>
</tr>
<tr>
<td>INEM – Instituto Nacional de Emergências Médicas</td>
<td>Portugal</td>
</tr>
<tr>
<td>Swedish Standards Institute and Ambulance Services in Greater Gothenburg</td>
<td>Sweden</td>
</tr>
<tr>
<td>West Midlands Ambulance Service – NHS Trust</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>Associated partner: Richmond Ambulance Authority</td>
<td>USA</td>
</tr>
<tr>
<td>Co-ordinator: Arbeitsgruppe GEOMED, Universität München</td>
<td>Germany</td>
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</table>

PRELIMINARY RESULTS

The wide variation of system designs is the main obstacle to benchmarking EMS systems. Therefore, past comparative studies have focused on specific aspects of the system, such as staffing, costs or clinical outcomes. In contrast, for a comprehensive comparison of EMS systems, overall tracking of the system’s response to the patient must be considered.10 Based on this assumption, the aim of the first EED workshop in November 2002 was to provide a detailed insight into the design and organisation of each participating EMS system. As a result, a generalised format of describing the patient journey from the first contact with the EMS system (access) until the recording of the outcome at the point of leaving the system has been developed (figure 2).

During the second workshop (January 2003), typical patient pathways through the various systems based on this standardised format were presented. In addition, the role and importance of national and international standards versus regional and/or local regulations for EMS were discussed.

Though EMS is available throughout Europe, methods of accessing the system differ. One problem highlighted during the workshop was that the efforts to establish a common emergency number seem so far not to have been successful. Despite the European Union’s recommendation for the introduction of a common phone number for medical emergencies (telephone 112) in the majority of Member Countries there are still different emergency numbers in use.112 has been introduced in most of the Member States, however, often as a second choice and not directly linked to the EMS system, causing considerable delay in emergency response (table 2).

EXPECTED CONTRIBUTION TO A EUROPEAN SURVEILLANCE STRATEGY

The EED Project is designed to contribute to the European Union’s interests in both monitoring the health status of its citizens and providing sound and reliable
information about determinants that influence the health status. By monitoring health status across Europe, the Community intends to strengthen its ability to respond rapidly to emerging health threats. With this early warning function, the Union aims to increase life expectancy free from disability, and to reduce the variations in health status and health outcomes across Europe.

By including EMS data into a pan-European health monitoring system, information about the most serious diseases – cardiovascular disorders, respiratory diseases and injuries (cf. the ‘first hour quintet’) – will be integrated into the Union’s health surveillance strategy. As a main result, the European Emergency Data project will identify a list of key indicators that are available continuously throughout Europe. The main focus will be on access to the system, operational and clinical issues, with economic efficiency also being considered. For the first time, based on these indicators, health status, trends and determinants in the pre-hospital setting will be examined. Specifically, it will be possible to monitor and analyse the emergency demand or health care utilisation of a population including stratification for socio-demographic factors (figure 3).

Furthermore, by differentiating health demand data regionally and displaying them in the form of maps, identification of problem areas for prevention programmes can be facilitated. Planning and evaluation of prevention programmes can also be supported and scenarios can developed using Geographic Information Systems (GIS).

The EED Project provides a basis for future implementation of further indicators and further collaboration between Member States. The project will also provide essential information for the individual Member States to evaluate pre-hospital health programmes and obtain a better understanding of how they impact on the entire health care system. It is also expected to help to lay the foundation for a more formalised benchmarking concept for EMS services across Europe and beyond.

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