

“SAR-First-Responder Sea”

— backgrounds to a medical education concept in German SAR service

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ABSTRACT

We present backgrounds to a medical education concept for the full-time rescue men on the vessels of the German Maritime Search and Rescue Service (DGzRS, English: GSRS). In contrast to land-bound emergency services, the daily work spectrum of the GSRS rescue men is mainly characterised by technical assistance for sea-going ships, and searching procedures but not medical emergencies. Nevertheless, severe medical exigencies might occur aboard sea-going ships, with immediate need of professional medical treatment. Thus, a professional medical training course adapted to the needs and costs of maritime search and rescue procedures at German Coasts was set up and has now been unveiled.

Key words: education, Search And Rescue, emergency ambulance systems, paramedics, prehospital care

INTRODUCTION

Historically, the qualifications of German land-bound paramedic services varied a great deal from federal state to federal state.

Due to efforts of all concerned parties during the last 30 years, harmonized curricula regarding the qualification of land- and air-bound Paramedics and Emergency Medical Technicians (EMTs) have been set up. Today it is regulated by federal law which qualifications/training programs fulltime Paramedics and EMTs need to have full time to execute land- and airbound rescue services in Germany. Commonly, professional Paramedics must pass an in-firm training course for two years with rescue schools, organisations like the German/Bavarian Red Cross, or full-time fire brigades. In cities with more than 100,000 inhabitants, a full-time professional fire brigade must be set up by law

while in country areas, organisations like the German or Bavarian Red Cross are responsible for carrying out paramedic services. This apprenticeship consists of several alternating 4-week-blocks of:

- theoretical education in human physiology and anatomy at a rescue school;
- clinical training in anaesthesiology, intensive care, emergency room; and
- traineeship with emergency rescue squads, ending up with a state-approved exam.

Furthermore, registered Paramedics must prove 30 hours of continuing education in the field of emergency medicine per year.

The situation is different with German coastal waters and on high seas. Here, the German Maritime Search and Rescue Service (GSRS) is commissioned to execute Search

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And Rescue (SAR) procedures, supported by the German Navy, which provides air-bound support via helicopter.

THE GERMAN MARITIME SEARCH AND RESCUE SERVICE (GSRS)

The German Maritime Search and Rescue Service (GSRS) was founded in 1865 and since then has executed a self-sustainable maritime SAR service to handle emergencies within Germany's North and Baltic Sea coasts for more than 140 years. The founders comprised 120 delegates representing numerous smaller local rescue societies who met in Kiel, Germany to form one uniform rescue organization for the German coast. The scope of the GSRS, as laid down by the founders and still valid today, is to implement, promote, and maintain an efficient maritime SAR service in the coastal waters and on the high seas, and to further the ideal of selfless commitment to saving human lives at sea thereby promoting international solidarity by human action. The GSRS is financed exclusively by voluntary donations.

In March 1982, the Federal Minister of Transport officially entrusted the GSRS with the performance, on his behalf, of maritime search and rescue in accordance with regulation 15 of chapter V of the 1974 International Convention for the Safety of Human Life at Sea and the 1979 International Convention on Maritime Search and Rescue. In cases of medical emergencies at sea, the GSRS is supported by the German Navy, mostly via helicopter (Seaking Mk 41). This is based on an administrative agreement between the Federal Minister of Defence and the Federal Minister of Transport concluded in 1979 to cover co-operation concerning the SAR service – the GSRS is solely and independently responsible for executing the SAR service while all other seaside services provide help in case of need. The Operation and Control centre for all SAR measures within the by the German Federal Ministry of Transport determined sea-areas (SAR areas) is based at the MARITIME RESCUE CO-ORDINATION CENTRE BREMEN (MRCC BREMEN) [1, 2]. The GSRS maintains a fleet totalling 61 rescue units based in 54 stations along the German coast, including:

- 21 rescue vessels between 23 m and 46 m in length that are manned by more than 180 specially trained full-time professionals (full-time rescue men). Depending on vessel size, the crew comprises of 3 to 7 members of either nautical or technical qualification;
- these 21 rescue units co-operate with 40 rescue boats, partly on trailers, with a staff of about 800 volunteers [1, 3].

All rescue vessels have, besides extensive technical and maritime equipment, an onboard hospital with equipment of similar standard to that of an average

paramedic unit of a German land-bound emergency service, including:

Bandaging material, an automated external defibrillator (AED), the possibility to deliver oxygen via a mask and other means of airway management (e.g. use of Combitube®/common endotracheal intubation), medical dispensary (contents in Table 1), and common equipment for cannulation of peripheral veins for managing haemorrhagic blood loss or application of medicaments. Of note is the 24-hour possibility of transferring patient data such as electrocardiograms to the city hospital of Cuxhaven/Germany via telemetry from individual rescue vessels. All SAR units of the GSRS can receive medical consultation and instructions from there by radio ("MEDICO-Talk") [3, 4].

Furthermore, in almost all stations, voluntary physicians are present who are available immediately – in the best case. These are physicians who cover all of the usual fields of medicine, often possessing an additional "Emergency Medical Service certificate". Today in Germany there is no obligatory curriculum for an official additional term "Emergency Medical Service at Sea" although societies like the German Society for Maritime Medicine (DGMM) are making efforts to implement such a qualification [5]. Although the Central Command for Maritime Emergencies (CCME) in Cuxhaven provides medical supply by land-bound emergency physicians from fire departments in Northern Germany in case of complex damage situations, e.g. mass accumulation of injured persons [6], an overall, standardised, individual-medical supply in the SAR areas does not exist.

Table 1. Contents of the medical dispensary onboard a DGzRS rescue vessel

Ampullarium onboard a DGzRS rescue vessel	
For intravenous application	For oral application
Atropin	Dexamethasone (aerosole)
Butylscopolamine	Diazepam (tablet)
Diazepam	Fenoterol (aerosole)
Epinephrine	Glyceroltrinitrat (aerosole)
Fortecortin	Nifedipin (tablet)
Furosemid	
Glucose 40%	
Ketamine	
Lidocain 2%	
Metamizol	
Metoclopramid	
Theophyllin	
Verapamil	

Thus, the rescuer might have to deal with complex disease and injury patterns such as polytrauma, severe burns, hypothermia, myocardial infarction, or apoplectic insults.

A further difference to the land bound emergency service concerns the fact that at sea, the incident might have occurred some way offshore, necessitating a lengthy journey back to land with a severely ill/injured patient requiring continuous treatment for several hours by the rescuer until brought ashore.

Apart from extensive nautical and technical qualifications, the full-time members of the rescue crew need to have at least a 16-hour First Aid course certificate when starting the job. Naturally, there are (a few) Paramedics and EMTs among the rescue personnel who originate from the land-bound emergency services and yield their qualifications into the maritime rescue service of the DGzRS. However, historically, a uniform, obligatory qualification „beyond” the First Aid certificate was not required. Today, on the three largest rescue units of the GSRS (stations: the Isle of Helgoland [North Sea], Cuxhaven [North Sea, outlet of the river Elbe], and the Isle of Fehmarn [Baltic Sea]), at least one crewmember on duty possesses the “EMT” qualification. In order to keep pace with today’s fast moving and progressive development of medical-technical equipment and to ensure that the personnel on the rescue vessel possess the appropriate qualifications, GSRS and Education Centre Schlump – Centre for Occupations of Health have implemented a standardised emergency-medical qualification for the rescue vessel crews. The target group for this qualification are crew members of technical origin; while the captain (“fore-man”) is responsible for the accuracy of the entire rescue mission, the “deck personnel” should consist of at least two members with the qualification “SAR-First-Responder Sea” to take medical care of possible patients in maritime emergencies.

Towards such a qualification, the following requirements have been identified:

- generally, having regard for the welfare of possible emergency patients, a standardised rescue qualification is required to ensure that all rescue personnel are as highly qualified as possible. Under the special circumstances of the maritime emergency service this is not compulsory, however, since a daily medical routine – which is important for professional operations – does not form a natural part of the everyday life of the full-time rescue operatives. The work of the crews consists of a relatively small portion of emergency medicine only; nevertheless, these might be severe on occurrence. The stations of the North Sea patrol a greater portion of seaways with medical indication than do the stations of the Baltic Sea, since the German North Sea islands

must also be supplied there, and patient transportation to the mainland must often be performed if weather conditions do not permit patient transportation via helicopter. These patients are mainly subserved by island practioners before transportation by rescue vessels, so that immediate medical intervention by the rescue crew might not be necessary. Overall, the daily work spectrum is mainly characterised by technical assistance for leisure and occupational navigators, so that a qualification like “Paramedic” or “EMT” – also considering the substantial time and cost for such training – is possibly desirable, but not practicable;

- nevertheless, the rescue personnel should be able to treat complex emergency medical situations adequately until the arrival of higher medical qualified personnel, something which might take some time due to the location of the incident and/or the time taken to deliver the patient to the land-bound emergency service, e.g. in the port;
- due to the rapid technical progress in navigation, there is an increased need for training and courses in many fields of navigation, in particular for the rescue team. A rescue qualification must be integrated into this scenario with justifiable expenditure of time. The service rhythm of the full-time rescue personnel consists of two weeks service onboard a rescue vessel followed by two weeks off duty. During leisure time, several nautical seminars and training courses must also be attended. A comprehensive training programme in emergency medicine, as e.g. with the education of Paramedics and EMT, would utilise a substantial part of the operative’s remaining spare time, and thus the motivation of the rescue personnel is paramount. These considerations led, in co-operation with the Education Centre Hamburg-Schlump, to the curriculum of a “SAR-First-Responder Sea”.

EDUCATION CENTRE SCHLUMP, HAMBURG/GERMANY

The Education Centre Schlump (Centre for Occupations of Health) is part of the German Red Cross Sisterhood Hamburg/Germany and offers qualified training and educational programmes covering practically all of the fields within the occupational health service. These educational courses are based on official or other acknowledged and validated programmes and comply with the appropriate curricular modules of the approving institutions [7]. Special emphasis is placed on the basic and advanced training of paramedics and EMTs for land-bound emergency services. Since 1992 the emergency training for the full-time rescue personnel of the GSRS has been undertaken by the Education Centre Schlump.

“SAR-FIRST-RESPONDER SEA”

The one-week training course “SAR-First-Responder Sea” takes place at the SAR School of the GSRS in Neustadt/Holstein (Northern Germany) during two weeks off duty. Besides this course, maritime rescue topics such as SAR procedures, maritime navigation, ship security, marine fire fighting, and handling of rescue techniques are taught from both a practical and theoretical perspective. Excellent and friendly relations are enjoyed with the adjoining barracks of the German Navy so that existing resources (Diver-Exercise-Hall, Fire-Hall, superseded frigate “KÖLN” for marine fire-fighting exercises) can be used together. Participants of the training course “SAR-First-Responder Sea” are instructed by two lecturers from the Education Centre Schlump who possess many years experience in the fields of emergency medicine. When starting the training course, the theoretical basics of human anatomy, physiology, and pathophysiology, and common emergency-medical diseases are taught to the 8–12 participants. These theoretical basics are followed by practical processing of emergency-medical case examples, including resuscitation training according to the Advanced Cardiac Life Support (ACLS). Besides two actors and two school owned boats, a 27-m-class rescue vessel or a rescue vessel of the 44-m-class are regularly available, so that case examples can be performed in a lifelike and realistic way: restrained spatial conditions (engine room, daughter boat), adverse external factors (weather, swell), and use of an onboard hospital including telemetry. Thus, a high degree of reality is achieved for the overall benefit of the trainees (Figures 1–2).

Due to the relatively small number of participants, it is possible for one team – similar to the land-bound emergency service consisting of a transportation leader and an assistant – to process a case example under supervision, while

the other participants, together with the teacher, note positive and negative aspects of the performance. Subsequently, discussions and reviews are undertaken. Thus, despite the restrictions on the available time of only one week, intensive training covering common emergency scenarios is achieved, whilst accepting that comprehensive training into the complex subjects of emergency medicine cannot be realised within the restricted time-frame permitted. As emergency medicine only reflects a small part of the daily work of the rescue vessel’s crew, emergency-medical operational sequences have been consciously standardised, so that each case example is processed using the same pattern, always starting with checking consciousness, respiration, and pulse (C-R-P) (Table 2). This creates practical security even in handling complex emergency-medical disease scenarios, since the rescue personnel can always return to this proven and often experienced pattern. The training course concludes with a written test (25 multiple-choice questions) as well

Table 2. Pattern for the processing of emergency-medical case examples, “SAR-First-Responder Sea”

1. C-R-P
2. First body check = overview = sighting (triage)
3. Vital parameters
4. Secondary body check
5. Measures
6. Transportation
7. Documentation
8. Transfer to land- or airbound service
9. Awareness to readiness of medical equipment



Figures 1–2. Processing of case examples onboard a rescue vessel – training course “SAR-First-Responder Sea”

Table 3. Timetable "SAR-First-Responder Sea"

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Greeting/course introduction/legal basics/organisation/ rescue/patients/ /tactical measures	Organisation/tactical measures/emergency rescue/patients/ /documentation	Thermal emergencies/ /abdominal emergencies	Processing of simulated care examples onboard a rescue vessel	CPR + airway management	Written examination
Onboard-equipment: medical + technical/ /MEDICO-talk/TMAS	Cardiovascular system: physiology/patho-physiology	Trauma: wounds/blood vessel injuries/treatment/bandages	Processing of simulated case examples onboard a rescue vessel	CPR following current ERC guidelines	Verbal-practical examination
Lunch time	Lunch time	Lunch time		Lunch time	Lunch time
Introduction of cardiopulmonary resuscitation (CPR)/disturbances of consciousness	Cardiovascular system: physiology/patho-physiology	Practical training: vacuum mattress/other immobilisation techniques	Processing of simulated case examples onboard a rescue vessel	CPR following current ERC guidelines	Structure of emergency services/ /course evaluation/farwell
Air way system: physiology/patho-physiology/ /management	Assisting intravenous injections + infusions/ /pharmacology	Practical training: pneumatic casts/ /vacuum casts	Processing of simulated case examples onboard a rescue level Processing of simulated case examples onboard a rescue vessel	CPR + telemetry/ /CPR + hypothermia/CPR + + defibrillation	

as a verbal-practical examination. The timetable is shown in table 3. Since implementation of the course began, the pass rate of both the written test and the verbal-practical examination is nearly 100%. Practically, a case example is processed and further theoretical aspects of the case are discussed and audited.

The training week is followed by a one-week practical course in the land-bound emergency service, which the participants undertake predominantly in fire departments of North German cities. Similar to the necessary practical courses for Paramedics and EMTs, a report book is written, and emergency alarms are documented. In the future, it is intended that the full-time rescue personnel repeat the course "SAR-First-Responder Sea" every 3 years without change in training lectures and practical skills training. Furthermore, trained SAR first responders are to multiply the medical skills in the GSRS fleet by teaching the volunteer staff.

CONCLUSIONS

We present backgrounds to a standardized rescue qualification adapted to the needs of the maritime search and rescue service which has been introduced on the German coast.

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COMPETING INTERESTS

There are no competing interests.

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