REUE | Special Article

Out-of-hospital Emergency Medical services in Spain. Evolution, experiences, and memories

Servicios de Emergencia Médica Extrahospitalaria en Spain. Tránsitos, experiencias y recuerdos

Andrés Pacheco Rodríguez

Introduction

A personal expert perspective on the evolution of hospital emergency departments in Spain was recently published in this journal.[1] On this occasion, it is our turn to present the other side: the view of an emergency physician on the evolution of the Out-of-Hospital Medical Emergency Services (SEMEx/SEM).[2]

A personal journey through Emergency Medicine in Spain

It was 1983, in Salamanca, and the author was completing his medical studies. He enjoyed volunteering in the emergency department of the *Hospital Clínico*. At that time, in 1984, he also read articles on medical transport, emergencies, and disasters.[3]

After gaining experience in military healthcare in the city of La Laguna (Tenerife, Canary Islands, Spain), and taking primary care shifts, in June 1987 he completed the University Certificate in Out-of-Hospital Intensive Medicine and obtained a position as a firefighter–medical specialist (licensed physician) in the Public Consortium SCIS–Emergencia Ciudad Real–006, dependent on the provincial fire service of Ciudad Real, equipped with staffed mobile intensive care ambulances (paramedic firefighter–driver and physician; without nursing personnel at that time).[4] That same year, the final congress of the Spanish Society of Emergency Medicine (SEMU) took place in Almagro; from it arose the Spanish Society of Emergency Medicine and Emergencies (SEMES) on October 3rd, 1987.[5] Similarly, when the journal Urgencias closed, its work was continued by EMERGENCIAS, in which the author had the honor of serving on the editorial committee (Proyecto Emerger), and which would later be indexed in the Journal Citation Reports.[6] In 1988, the first SEMES congress was held in Palencia, and the first issue of EMERGENCIAS was published, including an article on integrated emergency systems.[7]

Later, in 1990, he completed the University Specialist Course in Out-of-Hospital Medical Emergencies at Universidad Complutense (Madrid, Spain). This qualification included rotations in the intensive care unit of Hospital 12 de Octubre (Madrid, Spain)—a privilege—and out-of-hospital emergency shifts in the ambulances of the Spanish Red Cross in Madrid on weekends.[8] There he encountered the medical helicopter service of the Directorate General of Traffic ("abeja"), where he later performed transfers in 1990,[9] as well as missions aboard the military Super Puma Search and Rescue helicopter, transporting amputee patients for reimplantation to the INSALUD–Burgos hospital.

Also in 1990, the Out-of-Hospital Emergency Services of INSALUD and other administrations began to be created, including the Special Emergency Service SEU–INSALUD–061 Madrid and SAMUR. This provided opportunities for new experiences, leading him to work at 061 Madrid. In 1991, he joined *Helicópteros Sanitarios de Málaga*, the first private medical helicopter service in Spain.[10] Around this time, medical helicopters were also introduced in Don Benito, by the Catalan Generalitat, and by the Provincial Council of Zaragoza.

During these years he also became familiar with the GEM (Group of Medical Emergencies) of the Catalan Fire Brigade—medicalized rescue support helicopter—and the Catalan out-of-hospital emergency services (SCEM–SCUBSA–061–SEMSA). Furthermore, he learned the operation of the DGT–UNESPA medical helicopter service (1993–1996), operating on weekends in Valencia, Seville, and Málaga. International repatriation work followed, first with a Spanish company (Ambulancias Europa) and later with a Czech company, working alongside technicians fluent in Czech and Russian… but as the author jokes, "the real Czech was the author himself."

Another step was the experience as a hospital emergency physician in the emergency department of Hospital General La Mancha

Author Affiliations:
Gerencia de Urgencias, Emergencias y Transporte Sanitario, GUETS/SESCAM-Castilla La Mancha. Babcock-Avincis Helicopters MCS/SESCAM. Ciudad Real. Spain.

Corresponding Author:
Andrés Pacheco Rodríguez.
Gerencia de Urgencias, Emergencias y Transporte Sanitario, GUETS/SESCAM-Castilla La Mancha. Babcock-Avincis Helicopters MCS/SESCAM.
Ciudad Real. Spain.

E-mail:
apacheco1701@telefonica.net

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Centro (INSALUD/SESCAM), Alcázar de San Juan (Castile-La Mancha, Spain) (1997–2004), while simultaneously holding a position in the Emergency and Rescue Service of the Community of Madrid (SERCAM–085) in 1997.

In 1998, the Royal Decree regulating medical transport was published,[11] which included nursing personnel as part of the clinical team.

In Castile–La Mancha (except Ciudad Real), the SEMEx INSALUD–061 Castile –La Mancha began operations in 1999, and in 2001 a medical helicopter service with four aircraft was introduced.[12]

In 2004, he returned to Emergencia Ciudad Real, now integrated into the Emergency, Urgent Care, and Medical Transport Management Unit (GUETS/SESCAM Castilla–La Mancha), where he remains to this day. In 2006, SEMES published accreditation standards for emergency services,[13] and in 2009 the first manual on aeromedical transport was released.[14]

Current legislation on medical transport includes, in addition to the driver and emergency technician, nursing personnel. Moreover, "when the required level of care justifies it, a physician must also be present"—although the criteria to determine this requirement remain unclear.[14]

In 2017, he participated as medical coordinator in the creation of the SEMES Aeromedical Transport Working Group (GTAM).

Development of Spanish EMS and similarities with North American EMS

The author's perception of how Spanish SEMEx have evolved over the past 30 years—following the classic 15 components of the U.S. Emergency Medical Services system—is as follows:[16]

1. Professionals. Originally, personnel were volunteers from the Red Cross, Civil Protection, the Association Detente y Ayuda (DYA), and others. Later, beginning in the early 1980s, various healthcare services within fire departments incorporated medical or nursing professionals. Starting in the 1990s, INSALUD's SEMEx integrated physicians and nurses at the advanced level, except in certain Autonomous Communities.[17,18] In 1998 and 2012, as mentioned, legislation was passed regarding vehicle characteristics, equipment, and staffing.[11,15]

2. Training of professionals. Professional training depended largely on individual effort. Since formal training through medical and nursing residency programs (MIR and EIR) in emergency and urgent care is prohibited (not permitted) in Spain in the civilian sector—unlike other European countries (except Portugal)—the training acquired independently is not uniform. Professionals who later work in emergency care must also invest effort training in other specialties.

A survey showed that 40.5% of MIR applicants would be willing to undertake a residency in the specialty of Emergency Medicine (MUE). As this specialty does not exist in the civilian sphere, generational replacement is not guaranteed.[19] Curiously, this specialty does exist in the military sector in Spain—go figure…!.[20] It also exists within vocational training for emergency medical technicians, along with professional competency accreditation.[21]

3. Communications. There has been significant progress: from radio communications and pager messaging to mobile phones, geolocation, access to medical records, and the use of electronic health records. Direct communication between the responding physician and the receiving physician is advisable when appropriate. Real-time transmission of data and images is recommended. Drones will likely soon have a significant operational role.[22]

4. Transport organization. Still heterogeneous. National legislation exists concerning vehicle characteristics and staffing (for ground transport), but organizational structures vary. Ambulance crews or Primary Emergency Medical Units (AMEs/UMEs—mobile ICUs) belong to the regional health services' SEMEx. However, in a minority of areas, personnel belong to the base hospital.

Regarding aeromedical transport, there is no national legislation. Development of medical helicopter transport (HEMS) has been substantial. Some services even operate 24/7, including primary missions in emergencies, such as those in the Canary Islands (1994), Ibiza (1999), and Ceuta. On the mainland, SESCAM's medical helicopters began H24 operations in Cuenca (2006) and Ciudad Real (2013). Today, services are also operating in Cantabria and Catalonia. Fixed-wing medical aircraft operate in Menorca, Melilla, and the Canary Islands.

Various medicalized rescue-support helicopters exist in regions with remote-area incidents.[10-23]

Future outlook: Spanish SEMEx will likely operate with 3 levels: basic: technicians; intermediate: nurses; and advanced: physicians Where physician staffing is insufficient, they will operate in rapid-response medical vehicles (RRMV) without transport capability—acting on-scene in urban areas, and using a rendez-vous system with nurse-staffed ambulances in rural areas.

The activity and caseload of Spanish SEMEx were published in 2010.[24] Data on physician presence in European SEMEx were recently published.[25]

5. Categorization of hospitals and health care centers. Efforts have been made—such as defining reference centers and appropriate initial and final receiving centers—but in practice, decisions still depend on the actors in the care chain.

6. Intensive care units. Indications for direct vs. deferred ICU admission are now relatively well established. Along with emergency departments, cardiology (hemodynamics), neurology, and others, ICUs are among the most frequent collaborators with SEMEx.[26]

7. Public Safety (Civil Protection). There is no uniform national procedure. However, in areas where civil protection resources are operational, they provide support to SEMEx. A paradigmatic example of coordination/integration is SAMUR-PC (Madrid, Spain). Medicalized units integrated within Fire and Rescue Services have gradually been integrated into regional health SEMEx.

8. Public participation. The public should receive information and training on their SEMEx system and the justified indications for calling the emergency coordination

Figure 1. Care devices. Out-of-hospital medical emergency services in Spain.
1) Medicalized helicopter, Air ICU. Don Benito, Extremadura. 2) Medicalized ambulance. SAMUR-PC. Madrid City Council. 3) Medicalized ambulance, Mobile ICU, SEU-INSALUD-061. Castilla–La Mancha. 4) Medicalized helicopter. Firefighters SERCAM-085. Community of Madrid. 5) Red Cross ambulance-088. Basque Country. 6) Rapid Intervention Vehicles: SEU-INSALUD-061, Madrid, and SAMUR-092, Madrid City Council.

center (ECC). The public should also participate in system oversight. However, these activities are not uniformly regulated. Some SEMEx conduct perceived-quality surveys among users and the general population.

9. Accessibility to care. The generic emergency telephone number 112 coexists with the specific 061 number for medical emergencies. Dialing 061 connects directly to the Emergency and Urgent Care Coordination Centers (CECUEs) via the 112 network. In Europe, dedicated medical emergency numbers (15–18–118–113–122–144, 999…) are maintained, while 112 is also advertised in some countries.

A specific number for medical emergencies (061) and another general emergency number for all types of emergencies and for foreign visitors (112) is recommended. The still-existing numbers for activating fire and rescue services (080–085–088–1006) may coexist in areas where they are deeply established, as occurs in France (018).[27]

10. Interhospital transport. Assisted interhospital transport is performed in some regions by dedicated ad hoc teams—usually located at specific centers—while in others, it is carried out by the same (medicalized or non-medicalized) units, as just another type of intervention.[28]

11. Standardized medical documentation and records. Documentation evolved from carbon-copy paper reports to electronic medical records on tablets, sometimes with access to the patient's clinical history. However, there is still no unified standardized report format across all SEMEx.

12. Public education and information. SEMEx should establish public training programs on severe conditions and basic cardiopulmonary resuscitation with defibrillation. Some services have standardized programs; others collaborate with regional Ministries of Education to train schoolchildren.

13. Review and evaluation of outcomes. Quality control of care delivery is recommended to support continuous improvement.

14. Relationship with disaster assistance plans. Most SEMEx have working groups and response plans for mass-casualty incidents and disasters, integrated into Territorial Disaster Plans (Platecat). They are equipped with special vehicles, devices, and dedicated materials. Standardized triage using scientifically validated methods is recommended, and today, the use of electronic triage with geolocation and real-time access to patient data (Fast Triage App and CRIMA) is advised.[29]

15. Collaboration agreements with neighboring systems. Although detailed information is lacking, such agreements exist in most SEMEx.

Other considerations regarding the evolution of emergency systems

Technological advances have been remarkable: from simple defibrillator monitors without pacemakers, early pulse oximeters resembling car cassette players (and there-

Figure 2. Care devices. Out-of-hospital medical emergency services in Spain.
1) Medicalized Ambulance Castilla y Leon Health Service-Sacyl-061. 2) Medicalized Helicopter Babcock-Avincis SESCAM-Castilla La Mancha Health Service. Ciudad Real. 3) Medicalized Ambulance, Mobile ICU. SCIS Public Consortium-Ciudad Real Emergency-006. Castilla La Mancha. 4) Medicalized Ambulance with incubator. Special Emergency Service, SEU-INSALUD-061, Madrid. 5) Medicalized Ambulance. Firefighters Emergency and Rescue Service, SERCAM-085, Community of Madrid. 6) Medicalized Helicopter. Medical Helicopters. Malaga.

fore prone to theft), and huge blood-pressure devices affected by ambulance vibration, to very basic transport ventilators—where the most sophisticated piece of equipment might have been a manual chest-compression device.

Today's vehicles are far more comfortable and ergonomic, with anti-roll sensors for strong winds, shock-absorbing stretchers, and spring-assisted folding legs.

Modern electromedical devices—unthinkable 30 years ago—include: "flea-type" pulse oximeters; integrated blood-pressure monitoring within multiparameter screens; defibrillators with pacemakers and detachable wireless displays; capnography ($ETCO_2$); dry-chemistry devices for point-of-care blood testing; programmable mechanical cardiocompressors; portable ultrasound—what an invention! (The military anti-shock trousers, MAST, have now disappeared though). We now have syringe-pump infusion devices, pediatric immobilization systems, high-tech mechanical ventilators and incubators, supraglottic airway devices, and widespread video laryngoscopy. Soon, mini-scanners—already used in some foreign EMS—will arrive.[30]

Regarding procedures, prehospital fibrinolysis[31] in ST-segment elevation myocardial infarction is now integrated into care pathways. New extrahospital transfusion protocols for hemorrhagic shock have emerged—for example, the pioneering HEMS/Babcock-Avincis–SESCAM program in Ciudad Real (Spain), where, since 2014, the SESCAM medical helicopter has worked as a 24-hour Aerial Blood Bank (BASA), a project in which the author has participated from the start.[32-34] Other advanced procedures, such as ECMO and REBOA, have been used. Additional clinical codes (stroke, major trauma, TBI, suicide…) have been implemented in most SEMEx.

Electronic health reports via tablets with access to clinical records and teletransmission capabilities are now standard. In the future, real-time transmission of electronic stethoscope sounds, ultrasound images, and live video is expected.

Clear identification of staffing is advised, such as labeling ambulances and helicopters with "Physician" (as done in Europe: Médecin, Notarzt, Akutlæge) to avoid confusion.

Figures 1 and 2 illustrate early medicalized ambulances and helicopters from various Spanish SEMEx.

Conclusions

Not all past times were better—although they were exciting in the author's discovery of SEMEx and emergency medicine, with a 360° view and decades of perspective. However, self-training must be replaced by a formal specialty, a long-pending reform that may finally materialize in the coming months. It is unfortunate that retirement now prevents the author from experiencing this new chapter

from within. Nevertheless, teaching roles will continue, in emergency, urgent care, and disaster medicine—medicine of rainy days, of extreme heat and cold, of first responders at mass-casualty scenes, of uncontrolled home environments, or the shared coffee after a call. This is the frontline of emergency medical care.

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