

ESCAPE-NET and PARQ: a continuity for resuscitation science

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Out-of-hospital cardiac arrest is a worldwide issue

Sudden cardiac arrest (SCA) is a clinical situation that affects 1 in 1000 people per year with a survival rate of about 5-10 per cent (Kiguchi *et al.*, 2020). This event occurs suddenly and unexpectedly, and can occur both in people already suffering from heart disease and in people who were previously healthy. When this situation occurs outside of a hospital, it is called out-of-hospital cardiac arrest (OHCA).

The actions to be taken in the event of an out-of-hospital cardiac arrest to improve survival are summarised in the so-called 'chain of survival': early recognition and alerting of the emergency medical system (EMS); early initiation of cardiopulmonary resuscitation (CPR); early use of an automated external defibrillator (AED); timely arrival of the EMS; and post-cardiac arrest life support (Cummins *et al.*, 1991). The effectiveness of these actions depends on whether they are implemented one after the other, like links in a chain, and on whether they are implemented in a timely manner. The chances of survival in the event of cardiac arrest, in fact, decrease very quickly after the event: with every minute that passes, about a ten per cent chance of survival is lost, and after about five minutes, irreversible brain damage begins (Blom *et al.*, 2014).

The first links of this chain depend on the individual citizen. For this reason, public efforts to train the population in CPR manoeuvres and the use of AEDs have been increasing for several years, as such intervention before the arrival of EMS allows a significant increase in survival chances. Moreover, in recent years, first responder networks, i.e. CPR-trained citizens alerted via smartphone applications in case OHCA occurred in their vicinity to initiate CPR while waiting for EMS arrival, have also been implemented (Ringh *et al.*, 2015). However, despite global education and information efforts, the survival chance after such an event remains low, and a lot of efforts are still needed to improve survival chances (Gräsner *et al.*, 2020).

The need to boost research in OHCA

In 2017 the ESCAPE-NET consortium (The European Sudden Cardiac Arrest network towards Prevention, Education, New Effective Treatment) was created to discover inherited, acquired and environmental causes of SCA and improve resuscitation treatment for SCA. This network, which consists of 16 partners from ten European countries and was funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No. 733381, reached important achievements in the five years of its existence.

The creation of a shared database with more than 100 000 SCA patients and more than 10 000 DNA samples collected enabled the generation of more than 100 peer-reviewed papers. ESCAPE-NET helped to improve knowledge regarding multiple aspects:

- the discovery of novel risk factors for SCA, such as Hb1Ac and physical inactivity (De Ferrari *et al.*, 2019; Van Dongen *et al.*, 2020)
- the need to pay attention to patients whose contact with healthcare providers increases in a short time span as they are at higher risk of SCA (Zylyftari *et al.*, 2020)
- the importance of avoiding inappropriate prescription of non-cardiac drugs as they can increase the risk of SCA (Eroglu *et al.*, 2022)
- the need to improve first responder networks as they increase survival (Oving *et al.*, 2021)
- the fact that women have lower chances of survival after SCA than men (Blom *et al.*, 2019)
- the effect of higher socio-economic conditions in increasing SCA survival (Jonsson *et al.*, 2021)
- the effect of the COVID-19 pandemic on OHCA occurrence and survival chance (Baldi *et al.*, 2020; Marijon *et al.*, 2020).

However, all these achievements are not enough, as survival chance after SCA remains low and with large differences between geographies within Europe and

worldwide. This gives reason to boost research in OHCA, especially considering that about 343 496 OHCA cases occur every year in Europe, and only one in ten patients survive (Empana *et al.*, 2022).

The importance of PARQ project

Another great achievement of ESCAPE-NET, which may also represent its greatest legacy, is that it demonstrated how the key to improving knowledge in SCA occurrence and treatment is to bring together researchers from different areas institutions and countries. It is the main reason why the ESCAPE-NET consortium members decided to create the PARQ project (Sudden cardiac arrest Prediction and Resuscitation Network: improving the Quality of Care), which is supported by COST (European Cooperation in Science and Technology, grant agreement No. CA19137, <https://parq-cost.eu>).

The ambition of PARQ is to expand the network created within ESCAPE-NET in 2017–2022, involving more researchers, especially from institutions and countries not already represented. This is the only way to comprehend the complex mechanisms which underline the difference in survival chance published so far. As highlighted by the papers carried out within the ESCAPE-NET consortium, they impact the risk of SCA occurrence (both considering the patient and the situation in which the OHCA occurs), in how CPR is performed (including widespread training in CPR and AED use, media campaigns, dispatcher CPR instructions and first responder network) and in treatment immediately after CPR. The key to improving our knowledge about all these aspects is to include as many researchers as possible who have focused their research on SCA in their settings and bring them together to share different experiences and evidence from different geographical regions. In the first months of the PARQ project, the network has been enlarged both in terms of researchers and countries involved, but we still have a long way to go to achieve our goals. It is a big challenge, but we are confident it will also lead to important results.

The PARQ action will focus on the European differences in first-response treatment, in pre-hospital and Emergency Departments and Cardiac Arrest Centres, aiming to develop protocols for the implementation of CPR guidelines out-of-hospital and in-hospital.

A recent study (Empana *et al.*, 2022) of the ESCAPE-NET consortium analysed four large European registries (from France, Denmark, The Netherlands and Sweden). It showed that the average incidence rate of OHCA ranged from 47.8 to 57.9 per 100000 person-years. Still, the data only covered the population of Western and Northern Europe that have implemented educational programmes on CPR in schools and have a high bystander CPR rate.

In the EuReCa TWO registry, information was available for 50 per cent of the patients regarding the analysis of the type of CPR bystander. Survival rates for the cases with bystander CPR were similar to the overall survival rates (8.1 per cent and 9.0 per cent), meaning that more information is needed about bystanders and ways to increase the incidence of bystander CPR. The registry EuReCa ONE, including data of 10682 cases from 27 countries, reported a large variation between 6.3 per cent and 78 per cent in bystander CPR, and this shows the necessity of a common strategy made up of communication channels, programmes and educational methods, to increase the rate of out-of-hospital CPR initiated by bystanders.

The next step to increase the survival chance of OHCA in the pre-hospital system is the intervention of first responders. A questionnaire-based study (Oving *et al.*, 2019), collecting data from 29 European countries, described the types and roles of first responders across Europe and identified four main categories:

- firefighters
- citizen responders
- police officers
- others (e.g. off-duty EMS personnel, nurses or medical doctors, taxi drivers).

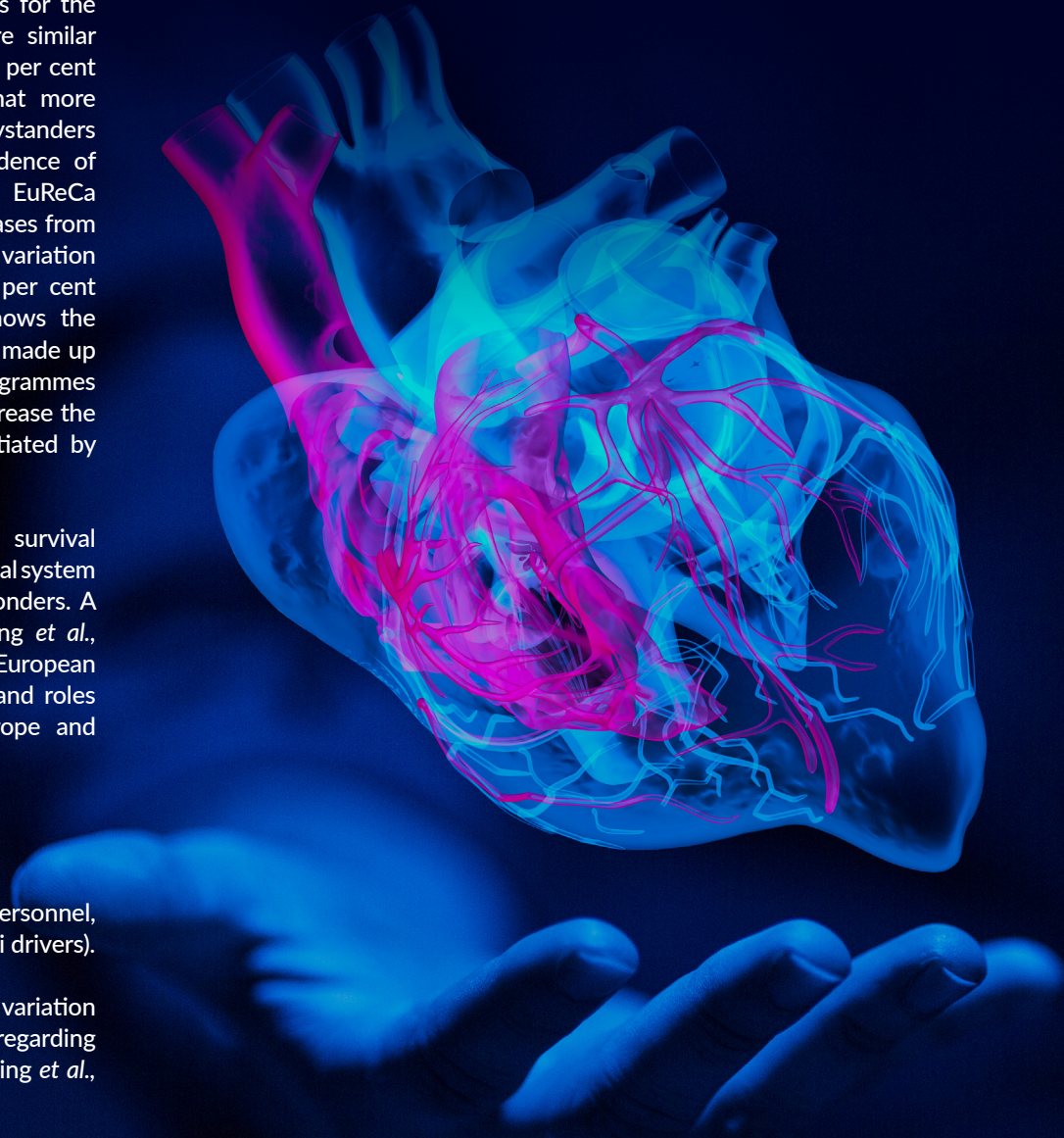
The same study identified variation between and within countries regarding the type of FR-system used (Oving *et al.*, 2019).

The high incidence of SCA, the variation in bystander and first responder interventions, and also the large scope of the EMS in Europe generated the need for continuity in CPR research, with the main goal of decreasing the mortality rate in SCA, and, therefore, PARQ-COST action is a catalyser for the diversity of scientific dissemination and communication in this domain.

The PARQ project presently covers 17 countries from the European Union. It offers the chance for interaction and communication between experts from

different areas of resuscitation science, which could increase networking and improve—through clinical studies, registries, educational and implementation strategies—the results of CPR in out-of-hospital and clinical settings.

In PARQ, there are four working groups, including representatives of those 17 European countries, investigators from areas of resuscitation science, cardiology, emergency medicine, genetics, statistics, molecular biology, general practice and health economics.



Objectives and tasks of the PARQ working groups

Working group 1

- Coordinate the organisation and expansion of current SCA population cohort studies by defining common standard operating procedures for collecting, processing and storing biological samples and patient information.
- Develop these procedures for harmonisation and analysis of big data in Europe to establish a large base of information about the risk factors of SCA.

Working group 2

- Coordinate risk prediction research and the development of risk prediction models.
- Research the relationship between individual risk prediction, first responder intervention and outcomes of SCA.

Working group 3

- Identify the technical and financial drivers behind emergency response and treatment procedures established in the participating European countries.
- Set up a network of scientists tasked with the dissemination of best practice guidelines in different countries.
- Evaluate the strengths and weaknesses of different first-response treatment procedures.
- Integrate proposals and identified solutions for SCA treatment into best practice guidelines.
- Develop a whitepaper for the best practice of SCA first-response treatment in different regions.

Working group 4

Working group four aims to expand the PARQ network through communication and dissemination activities, strengthening the interactions between experts in SCA risk prediction and resuscitation science. The tasks of the group are aligned accordingly.

- Design a PARQ website including objectives, member information, education curriculum, publications, the stakeholders and activities; to extend the network, organising print form materials, creating a LinkedIn page and Facebook, Instagram and Twitter accounts
- Disseminate PARQ results, including whitepapers for best practices outside of the PARQ network and recruit new members
- Implement new knowledge and procedures through education—training programmes equivalent to European summer schools
- Establish a network for the dissemination of project results to governments, regulatory bodies, emergency medical services organisations and the general public.

In a report by The National Academies of Sciences, Engineering and Medicine (2017), the five general goals of science communication were: (i) sharing recent findings and excitement for science; (ii) increasing public appreciation for science; (iii) increasing knowledge and understanding of science; (iv) influencing the opinions, policy preferences and people behaviour; (v) considering a diversity of perspectives about science when pursuing solutions to societal

problems. The ESCAPE-NET and PARQ projects were designed with these goals in mind.

Conclusion

In conclusion, the PARQ Action researchers will enable breakthrough developments leading to a decrease in the incidence of SCA, improved survival rates and a reduction in the vast regional European differences.

R References [click here](#)



PARQ COST Action

PROJECT SUMMARY

PARQ aims to create a network of researchers across Europe whose overall aim is to reduce the societal burden of sudden cardiac arrest (SCA). To reach this aim, PARQ will conduct studies that focus on two dimensions: (1) prevention of SCA through the discovery of its inherited, acquired, and environmental causes, and their interaction, and improved recognition of individuals at risk; and (2) improvement of survival chances after SCA through the development and implementation of resuscitation treatments in the community.

PROJECT PARTNERS

At present, the PARQ consortium consists of partners from 17 COST countries across Europe: Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, The Netherlands, North Macedonia, Norway, Romania, Slovakia, Spain, Sweden and Turkey.

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