

OUT-OF-HOSPITAL CARDIAC ARREST A STRATEGY FOR SCOTLAND



OUT-OF-HOSPITAL CARDIAC ARREST A STRATEGY FOR SCOTLAND

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FOREWORD



Out-of-hospital cardiac arrest (OHCA) is a significant healthcare challenge in Scotland. Approximately 3,500 people undergo attempted resuscitation each year after OHCA, but currently only around 1 in 20 survive to hospital discharge.

We know from international experience that higher rates of survival are achievable. This report highlights some of the countries where a concerted effort to improve the response to OHCA has resulted in much better survival rates. Building on the examples of good practice already in place in Scotland, there is much that we can learn from international centres of excellence and apply those lessons here.

The science behind what it takes to improve survival is not difficult to understand. However, delivering a consistently effective response to OHCA is not straightforward.

The 'Chain of Survival' describes the crucial elements that can save a life when someone has an OHCA: early recognition that a cardiac arrest is happening; early cardiopulmonary resuscitation (CPR) to buy time; early defibrillation to restart the heart; and post-resuscitation intensive care to restore quality of life.

In addition to these traditional elements of the chain of survival, this strategy introduces the idea of the 'augmented' chain to acknowledge the importance of community readiness to respond to OHCA and the rehabilitation and aftercare of those patients and families involved.

A key component of this plan is to strengthen how performance and outcomes of resuscitation care are measured and reported. This information is needed to monitor the progress of this plan, but more importantly, to inform everyday clinical practice and service delivery, and so help shape the quality of care delivered to all our communities.

We have the opportunity to engage with the public and all those with an interest in OHCA in order to work together to change the way we tackle the challenge of out-of-hospital cardiac arrest. If we can get this right, many more Scottish lives will be saved – perhaps 1,000 more by 2020.

By working together and looking for ways of doing things better we have a very real opportunity to significantly improve our response to OHCA and save many lives. This document is a call to action, a commitment and an invitation to participate in a collaborative effort to ensure that Scotland becomes an international leader in OHCA outcomes.

A handwritten signature in black ink that reads "Maureen Watt". The signature is written in a cursive, flowing style.

Maureen Watt, MSP
Minister for Public Health

BOX 1

What's the difference between a 'heart attack' and 'cardiac arrest'?

A heart attack is a sudden interruption to the blood supply to part of the heart muscle. It is likely to cause chest pain and permanent damage to the heart. The heart is still sending blood around the body and the person remains conscious and is still breathing.

A cardiac arrest occurs when the heart suddenly stops pumping blood around the body. Someone who is having a cardiac arrest will suddenly lose consciousness and will stop breathing or stop breathing normally. Unless immediately treated by CPR this always leads to death within minutes.

A person having a heart attack is at high risk of experiencing a cardiac arrest.

Both a heart attack and a cardiac arrest are life-threatening medical emergencies and require immediate medical help. Call 999 if you think you are having a heart attack or if you witness someone having a cardiac arrest.

Source: <https://www.bhf.org.uk/heart-health/conditions/cardiac-arrest.aspx>

BOX 2

The Story of a Survivor: The Chain of Survival

Gregor (44) is normally very fit and healthy. He collapsed at home in rural East Lothian and was discovered by his 10-year-old son who alerted the patient's wife. Gregor's wife started CPR while his 13-year-old daughter called 999.

With encouragement from the ambulance control call taker, the two children



Gregor (centre) with his wife and the Community First Responder.

ran barefooted across the road and summoned help from a nearby hotel. Bystander CPR was performed until a member of the local Community First Responder (CFR) group arrived and defibrillated Gregor, restarting his heart. The ambulance service then arrived and took over care, transporting Gregor to the nearby hospital for specialist care. Gregor has made a full recovery and now has a defibrillator in his chest in case this happens again. He is back at work.

This case illustrates the successful operation of the chain of survival in a rural area. Early recognition that Gregor's heart had stopped, a call for help and bystander CPR with coaching from the Ambulance Control Centre (ACC) bought time until further help arrived. This part of rural Scotland can be difficult to reach quickly with an emergency ambulance and ACC were able to summon the help of a specially trained Community First Responder to continue resuscitation by using a defibrillator before the ambulance arrived. Following his hospital admission, Gregor underwent further investigations which identified the root cause of his abnormal heart rhythm which led to his cardiac arrest. Definitive treatment was then put in place.

EXECUTIVE SUMMARY

This strategy, which has been jointly produced by a broad coalition of stakeholders, sets out our commitment to improve outcomes after out-of-hospital cardiac arrest (OHCA) and an ambition that by 2020 Scotland will be an international leader in the management of OHCA.

- We aim to increase survival rates after OHCA by 10% across the country within five years. Reaching this level of performance would mean around 300 more lives being saved every year compared to recent years. Starting an improvement programme now could result in a total of 1,000 additional lives saved by 2020.
- We aim to equip an additional 500,000 people with CPR skills by 2020. Increasing the incidence of bystander CPR is the cornerstone of improving outcomes because prompt bystander CPR can increase the likelihood of survival after OHCA by 2 or 3 times.

Out-of-hospital cardiac arrest (OHCA) remains a significant healthcare challenge in Scotland. Approximately 3,500 patients undergo attempted resuscitation each year after OHCA. Nationally, survival rates from this condition are low compared to the European average, with considerable variation in outcomes between communities. European centres with the best survival rates return almost a quarter of all OHCA victims home alive. In Scotland around 1 in 20 survive to hospital discharge.

The key factors in determining survival from OHCA are early, high quality cardiopulmonary resuscitation (CPR) and counter-shock therapy (defibrillation). All patients who have a survivable cardiac arrest require CPR and the majority also require defibrillation, both of which must be applied in a matter of minutes in order to be successful. CPR and defibrillation can be performed by ambulance first responders, other first responders in the community, or bystanders (if equipment and instruction are made rapidly available). The interplay of these key elements forms the 'Chain of Survival' which a person must successfully pass through in order to go home from hospital neurologically intact. Optimising the Chain of Survival across the whole system of OHCA management means delivering:

- Prompt recognition of OHCA and call for help
- Early, high quality cardiopulmonary resuscitation (CPR) to buy time
- Early defibrillation to restart the heart
- Rapid access to advanced resuscitation skills (e.g. airway management, oxygen therapy, fluid resuscitation and drugs) for those requiring further resuscitation
- Prompt, high quality post resuscitation care
- Transport to the nearest appropriately equipped centre for specialist support. After the return of a pulse (ROSC – return of spontaneous circulation) patients usually require admission to an Intensive Care Unit (ICU) with Cardiology input to preserve heart and brain function
- Co-ordinated rehabilitation services to care for patients and their families

It is essential that the Chain of Survival is underpinned by good data. A comprehensive registry of OHCA cases is at the heart of all the conspicuously successful centres around the world. Scotland's uniquely rich healthcare data offers the possibility of a truly world-leading system, collating information about the whole chain of survival across the whole of the country. This would be a powerful driver for improvement.

The success of this strategy will depend upon the commitment and action of many individuals and organisations. It will require concerted clinical and political leadership and a change in culture around OHCA. A coalition of stakeholders including emergency services, primary and secondary healthcare providers, third sector groups and academics will be required to ensure impact, efficacy and sustainability of a national solution to increased survival from OHCA.

Implementation of this national strategy will be focused on the following aims:

A. Early Recognition

Aim: To ensure that those who witness an out-of-hospital cardiac arrest (OHCA) promptly call 999 and are enabled to carry out immediate Cardio-Pulmonary Resuscitation (CPR) and use a Public Access Defibrillator (PAD), where available, until support arrives.

B. CPR (Cardio-Pulmonary Resuscitation)

Aim: To increase the rate of bystander CPR.

Aim: To equip an additional 500,000 people with CPR skills by 2020 and create a nation of life savers.

C. Defibrillation

Aim: To rapidly deploy available assets which routinely carry defibrillators – ambulances and others where appropriate such as Scottish Fire and Rescue Service (SFRS) and Community First Responders.

Aim: To put in place effective arrangements to ensure that Public Access Defibrillators (PADs) are mapped, maintained and accessible to the public.

D. Pre-Hospital Advanced Life Support

Aim: To ensure high quality resuscitation is delivered consistently in the pre-hospital care environment.

Aim: To ensure that patients – either during or after cardiac arrest – are taken to a location with appropriate post cardiac arrest care.

E. Post Resuscitation Care

Aim: To ensure that patients treated in hospital following OHCA receive optimal care.

F. Rehabilitation and Aftercare

Aim: To ensure that post event care and support is available to patients and their families/carers after OHCA.

Aim: To ensure that bystanders and others impacted by OHCA are supported after the event.

G. Culture and Context

Aim: To collect, analyse and report accurate and complete data on OHCA in order to inform decision making and improve outcomes after cardiac arrest.

Aim: To improve and simplify the capture of data by SAS to support clinical care and contribute to the cardiac arrest registry.

Aim: To reduce inequalities in survival after OHCA.

Aim: To strive to ensure that communities in remote and rural locations have equity of treatment for OHCA.

Aim: To encourage a greater public awareness of the ‘right thing to do’ and an increased willingness to help when present as a bystander at an OHCA.

Aim: To engender the belief amongst staff and members of the public that with effective action, OHCA can be a survivable event.

Aim: To develop and maintain an environment which supports innovation and research leading to improved outcomes in OHCA.

BACKGROUND

SHAPE OF THE PROBLEM

Out-of-hospital cardiac arrest: A healthcare challenge

Out-of-hospital cardiac arrest remains a significant healthcare challenge in Scotland. In 2011/12 the Scottish Ambulance Service responded to approximately 8,900 adult OHCA calls, 3,058 of these resulted in resuscitation attempts.¹ Although almost a third of these patients had a favourable 'shockable' heart rhythm, overall only 16.1% had return of a pulse (i.e. return of spontaneous circulation, or ROSC) before arriving in the Emergency Department. Having reached hospital, not all survive to leave hospital alive. Because of the greater distances involved, responding quickly to an OHCA in remote and rural locations is particularly challenging for emergency services. We also know that for a number of reasons, outcomes from OHCA are not as good in more deprived communities.

It should be noted that data on survival to discharge after OHCA has not been routinely collected on a national basis in Scotland. However, extrapolating from the number of patients who had ROSC it is likely that only around 1 in 20 patients survives to discharge in Scotland following OHCA.

International comparisons of OHCA survival

This picture of poor survival after OHCA is not universal in developed countries. There is significant differences in survival after OHCA between centres across the USA and between different European cities.^{2,3,4,5}

Figure 1: Difference in survival to discharge for OHCA (all rhythms) treated by emergency medical services in USA and EU.

	USA	EU
Best	16.3%	22.0%
Worst	3.0%	3.6%
Fold Difference	5 times	6 times

Seattle & King County in the state of Washington, USA – currently among the best for regional OHCA survival – reported an overall (all-rhythms) survival to discharge rate of 22% in 2013.⁶ Across Europe, the average go-home survival rate is almost twice that of Scotland at around 9%.⁵ Currently the single centre with the best OHCA outcomes is Stavanger, quoting 25% overall survival.² The whole-country registries reported in the literature illustrate this pattern with significant inter-regional variation in outcomes, e.g. the All-Japan Registry reporting a range of neurologically intact survival from 1.9% to 3.1% after OHCA (2005-07).⁷ In contrast the Swedish national registry illustrates the potential of whole system optimisation to improve outcomes across a nation reporting an increase in OHCA survival from 4.8% in 1992 to 10.7% in 2011.⁸

There is much to learn about improving OHCA outcomes from the experience of international centres of excellence. Box 3 summarises the key lessons.

BOX 3

Learning from International Experience

There is much we can learn from other areas to help us address the challenges. Centres of excellence and international leaders in OHCA are to be found in North America (e.g. Seattle, Arizona, Maryland, British Columbia), in Scandinavia (e.g. Copenhagen, Stavanger) and in Australia (e.g. Melbourne). Although each system has its own nuances, there are a number of themes that are consistent across them all.

- **A cardiac arrest registry.** ‘You can’t improve what you don’t count’. Linking ambulance data with other clinical data bases allows patient outcomes to be measured and system performance and service changes to be monitored.
- **Mapping and dispatching community first responders and defibrillators.** Outcomes are improved by enabling the ambulance service to maximize the use of available community resources. This includes the development and use of smart phone apps to direct bystanders to the nearest public access defibrillator.

Box 3 continues on next page

- **Concerted efforts to increase bystander CPR rates.** Most cardiac arrests are witnessed and most happen in the home. In the vital minutes before the arrival of the emergency services, bystander CPR can be the single most important factor determining survival. Strategies to increase bystander CPR rates successfully applied elsewhere include CPR training in schools and colleges; CPR training and siting of PADs in government and healthcare facilities, embedding CPR training into the employment practices of publicly funded organisations; CPR assessment as part of the driving licence system.
- **Multiple, emergency service co-responders.** Utilising the resources and skills of other statutory bodies such as the fire and police services, who are trained and equipped to respond rapidly to cardiac arrest. These services may be able to respond more quickly than the ambulance service, particularly in remote and rural areas. Mapping of these assets to the ambulance service dispatch system is crucial to ensure a consistent response.
- **Rapid deployment of advanced paramedics.** Secondary cardiac arrest response by highly skilled advanced paramedics specialising in cardiac arrest has been shown to save lives. Scotland's 3RU programme, which began in Edinburgh, is internationally recognised as a leading example of such a model. This could also be explored by other enhanced pre-hospital care teams such as the critical care paramedics in EMRS.
- **Dedicated receiving units for post cardiac arrest.** Clear and well understood patient pathways to deliver people with life threatening emergencies to appropriate care facilities.
- **Performance feedback.** All high-performing systems have robust clinical governance and feedback systems in place across their whole system to ensure that individuals and teams receive useful information about their performance during resuscitation of cardiac arrest. Skills, motivation and morale are all seen to improve when effective feedback is in place.

Benchmarking, networking and learning from centres of excellence will enable Scotland to build upon what we already have in place and help us to work towards our national ambition of being recognised as an international leader for our approach to out-of-hospital cardiac arrest.

System of care

Regional differences in survival after OHCA do not reflect a range of medical approaches – resuscitation guidelines are the same in all of these locations. Similarly, higher rates of survival in some centres cannot be fully explained by differences in patient demographics or health infrastructure. These observations strongly suggest that OHCA, in many cases, is a treatable condition, and that outcomes are dependent on the effectiveness of the overall system of care.

Quality of life for survivors of OHCA

The majority of survivors after OHCA are discharged from hospital to live independent lives. A recent audit of 107 consecutive survivors after OHCA admitted to the intensive care unit at Edinburgh Royal Infirmary showed that only 1 patient out of 53 survivors was discharged with severe neurological disability.⁹ This finding is consistent with other centres e.g. a large multi-centre European study of ICU management of OHCA (939 patients) found that 91% of survivors were discharged neurologically intact, to independent living, similarly the Ontario Pre-hospital Advanced Life Support study found that of 305 survivors, 96% were living independently at 12 months.¹⁰ The consensus of recent work in this area is that cognitive impairment (e.g. memory problems) is common in cardiac arrest survivors, but has little effect on activities of daily living or quality of life.¹¹⁻¹³

The importance of a quick reaction

Rapidly initiated CPR and defibrillation are of paramount importance. Bystander CPR can increase a patient's chances of survival by 2-3 times,^{14,15} however time is everything. Untreated, the survival chances of a patient in VF decrease by an estimated 10% per minute. Bystander CPR buys time, halving the rate of this decrease. Survival probability is higher if shocks are delivered earlier, and higher still if bystander CPR is performed. See Figure 2 below.

Defibrillation and CPR

Defibrillation works in synergy with CPR, and is most effective the earlier it is performed. Delivering a defibrillatory electrical shock to the heart within 3-5 minutes of collapse can produce survival rates as high as 75%.

Defibrillation is the only successful treatment available for the commonest heart rhythm disturbance causing OHCA – ventricular fibrillation (VF). Defibrillation consists of delivering a therapeutic dose of electrical energy to the heart using a device called a defibrillator. The earlier defibrillation is performed, the more likely it is to be successful in restarting the heart. The rapid reduction in the likelihood of survival can be slowed if CPR is performed to 'buy-time' until defibrillation can be performed.

In order to achieve early CPR and defibrillation, Scottish Ambulance Service responders must arrive at the scene as quickly as possible. In areas where geographical constraints make this a challenging goal, these actions could be carried out by trained first responders (e.g. CFR or Fire Service) or willing bystanders, coached by Ambulance control call-takers. It is crucial to understand that improving the in-hospital care of patients after OHCA is almost irrelevant to improving overall survival figures **unless** we first optimise what occurs pre-hospital, during the first few minutes after OHCA. A patient who is successfully resuscitated before arriving at the Emergency Department is 35 times more likely to survive to hospital discharge than a patient who arrives without a pulse.¹⁶

Post Resuscitation Care

After the initial resuscitation phase, a complex series of interventions is required to ensure the best chance of a patient’s long-term survival. Key elements may include rapid stabilisation in the Emergency Department, Percutaneous Coronary Intervention (PCI) by Cardiology and ventilatory support with temperature management by Intensive Care. This combination of interventions is not available in all hospitals resulting in the need for secondary transfer to specialist centres – this suggests a rationale for regionalisation of post-arrest management similar to that for major trauma, stroke and myocardial infarction.

Figure 2: The effect of bystander CPR and call-to-shock interval on the likelihood of survival to hospital discharge.

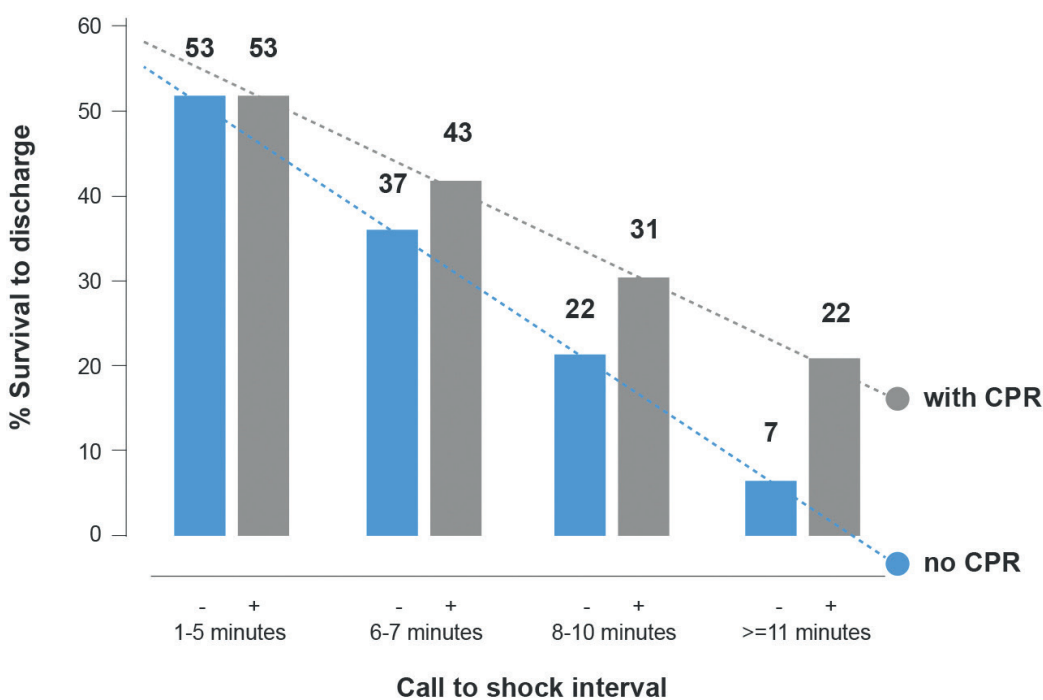
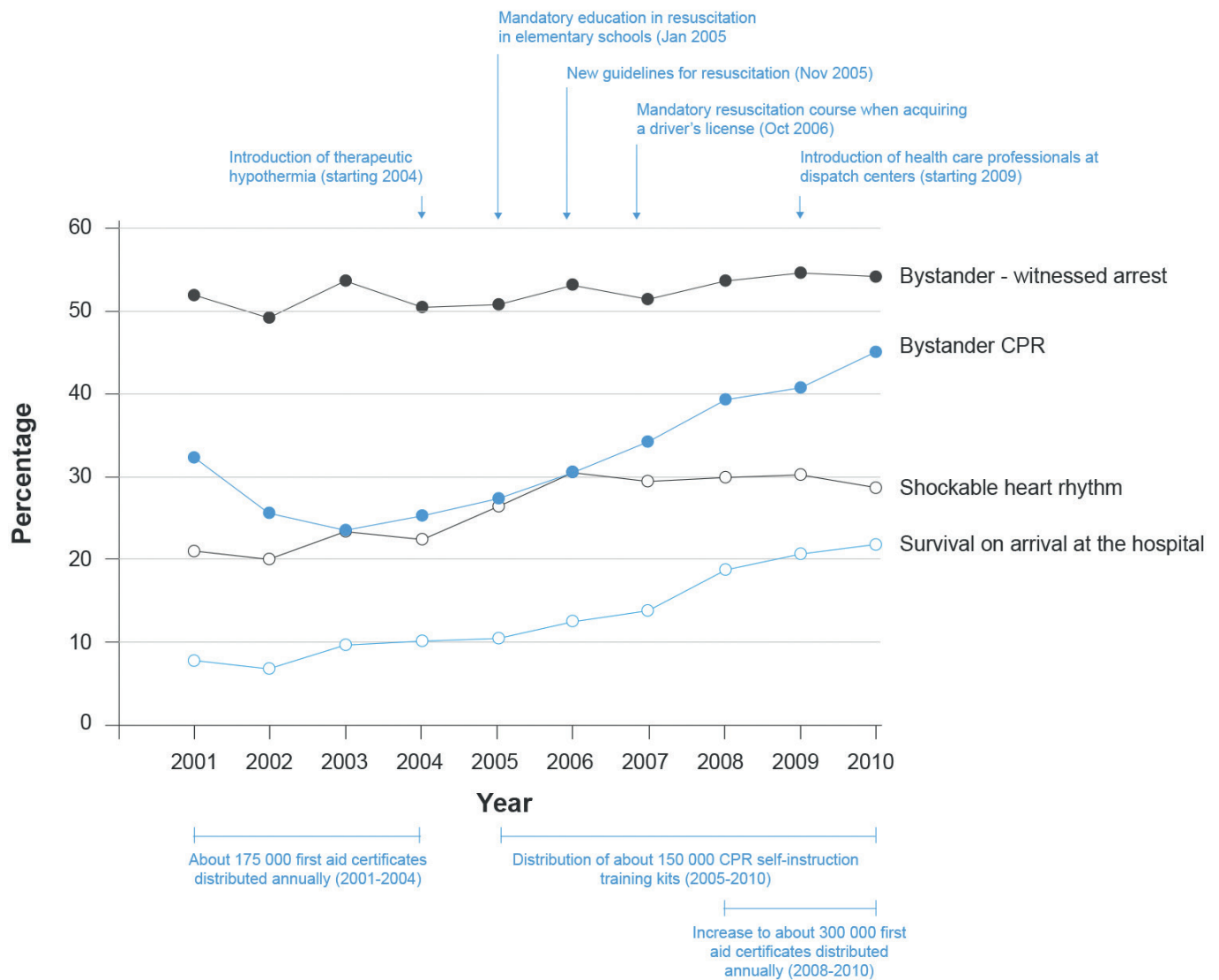


Figure 3: Impact of the Danish ‘Survival’ Programme. Bystander witnessed arrest, Bystander CPR, Shockable heart rhythm as first recorded rhythm and Survival on arrival at the hospital, Denmark 2001-2010.¹⁷

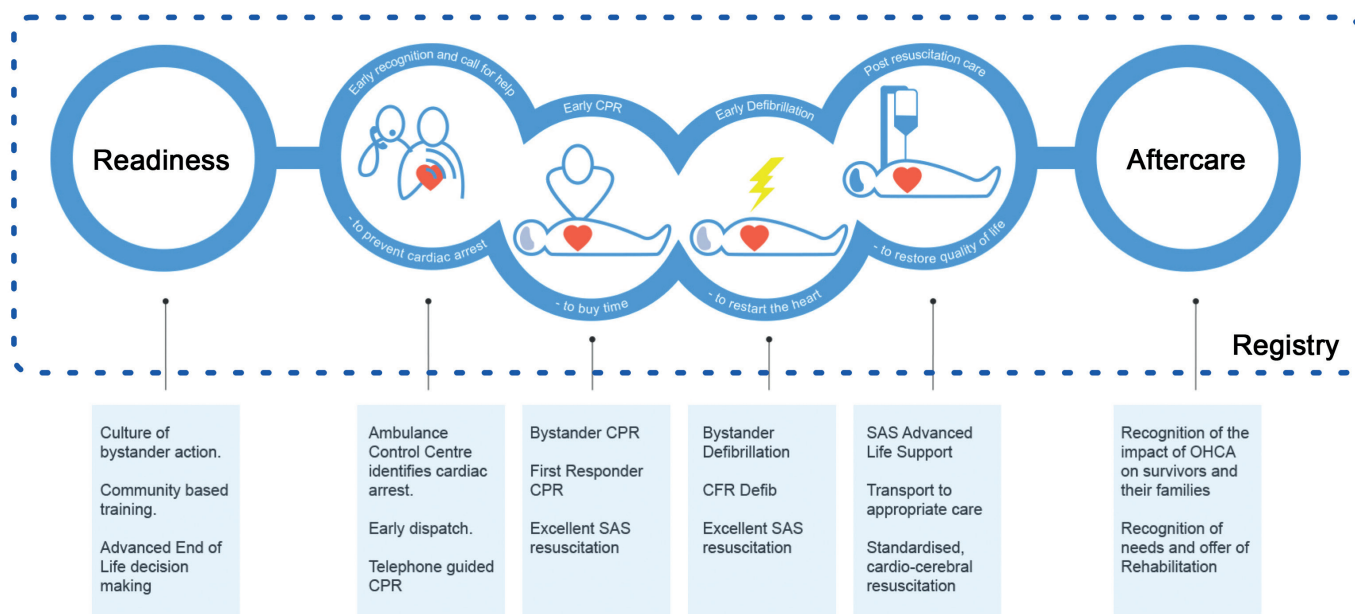


This figure from published work in Denmark illustrates the increase in survival after OHCA in parallel with a rise in the incidence of bystander CPR. The increase in CPR was achieved after a range of measures including mandatory resuscitation training in schools and legislation to make CPR training part of acquiring a driver's licence.

OPTIMISING THE CHAIN OF SURVIVAL

Achieving our ambition of Scotland matching the OHCA outcomes achieved by the best systems in the world will require a broad range of actions and improvements to address all the elements of the ‘augmented chain of survival’, (see Figure 4).

Figure 4: The ‘augmented chain of survival’ ¹⁸



In addition to the traditional elements of the chain of survival, the ‘augmented’ chain includes community readiness to respond to OHCA and the rehabilitation and aftercare of patients and families involved. These additional links are not usually emphasised, but are crucial to improving outcomes after OHCA across all of the communities in Scotland.

A chain is a good metaphor for the series of events required to resuscitate someone after OHCA. It is a reminder that all of the links must be robustly joined. Individual elements have limited value if the links preceding and following are not also strong.

The diagram above highlights the whole chain occurring in a context of good data. A registry based on robust and systematic data collection provides the information needed for governance, benchmarking and to drive quality improvement.

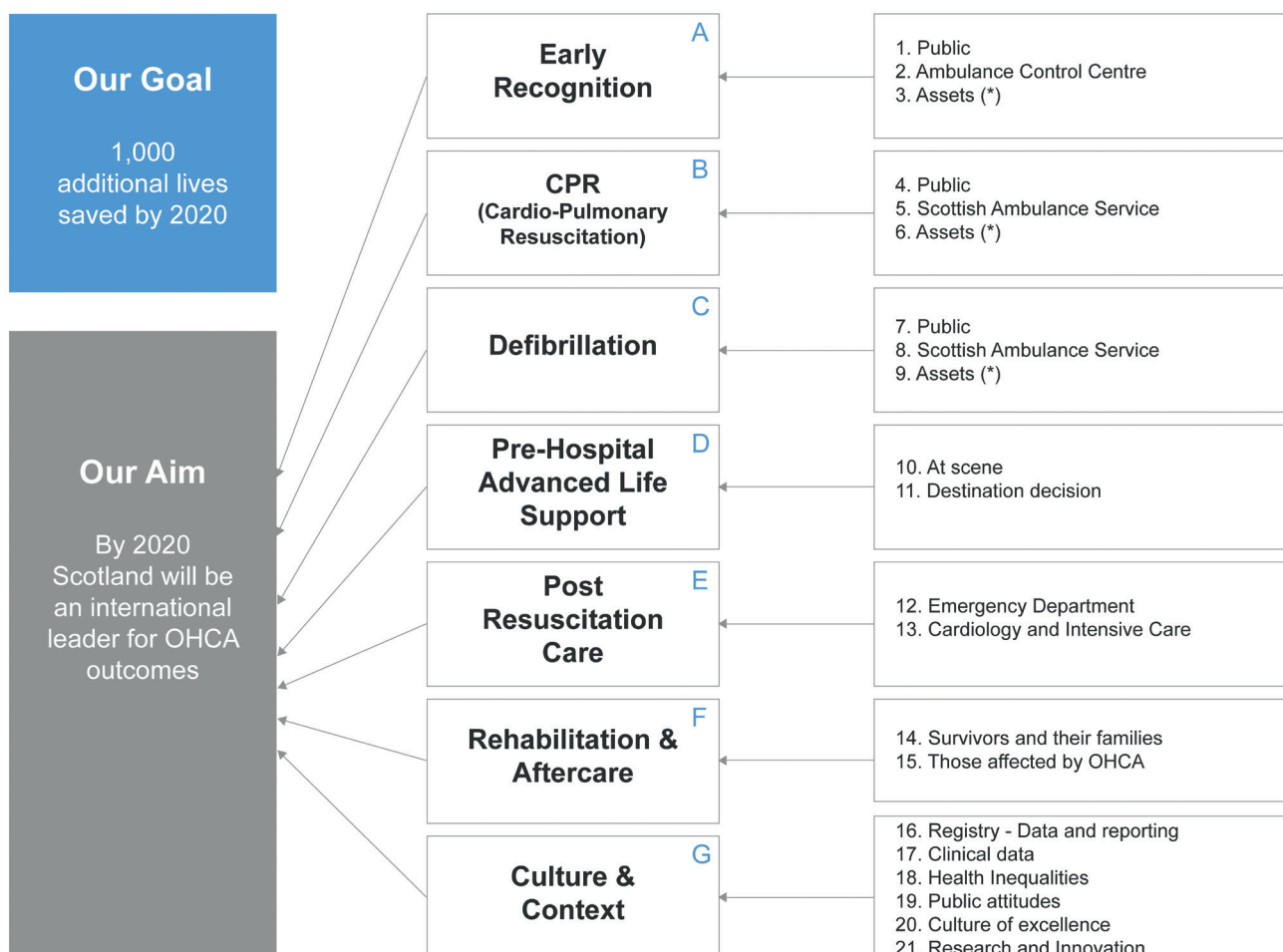
TAKING ACTION

The chain of survival can only be as strong as the weakest link in the chain, so all components need to be addressed. In order to deliver improved OHCA outcomes a framework of seven themes has been identified.

- A. Early Recognition
- B. CPR (Cardio-Pulmonary Resuscitation)
- C. Defibrillation
- D. Pre-Hospital Advanced Life Support
- E. Post Resuscitation Care
- F. Rehabilitation and Aftercare
- G. Culture and Context

Under these themes, a series of actions and improvement programmes across 21 dimensions are described. The first 15 of these are the primary interventions, the others which are grouped under 'Culture and Context' are enabling interventions.

Figure 5: Improving Out-of-Hospital Cardiac Arrest (OHCA) in Scotland



*By **Assets** we mean the people, organisations and equipment which could be made available or used more effectively in order to deliver improvement.

A. EARLY RECOGNITION

Cardiac arrest is a sudden, medical emergency in which a person is highly unlikely to survive unless immediate and effective action is taken. The response of those who happen to be present during an OHCA is crucial.

Aim: To ensure that those who witness an out-of-hospital cardiac arrest (OHCA) promptly call 999 and are enabled to carry out immediate Cardio-Pulmonary Resuscitation (CPR) and use a Public Access Defibrillator (PAD), where available, until support arrives.

1. Public

There is a need to raise awareness through education, campaigns and other initiatives in order to increase the likelihood that members of the public recognise sudden cardiac arrest and quickly call for help. The public can also be reassured that if they do call 999 they will receive expert help and advice from the call handlers.

2. Ambulance Control Centre

SAS call handlers need to reliably and rapidly recognise that a patient is in cardiac arrest in response to an emergency call from a member of the public and then efficiently and effectively manage the call to support those immediately at the scene and to ensure that the appropriate resources are dispatched. We require a system to measure the accuracy of ACC in identifying OHCA and a process of support, training and feedback to ensure optimal ACC performance.

3. Assets

SAS control rooms need to have access to up to date and accurate information about all available responding assets. These assets could be ambulances, fire and rescue personnel, community first responders, doctors (including BASICs) or other trained responders. The aim is to ensure the fastest possible response to sudden OHCA.

BOX 4

Ambulance Control Centres

The Ambulance Control Centre (ACC) is the centre of the co-ordination of all the resources involved in the pre-hospital care of out-of-hospital cardiac arrests.

ACC call handlers need to be effectively trained and supported and then reliably use the best triage tools available so that they can:

- Rapidly identify cardiac arrest. Reliably and rapidly recognise that an individual is having a cardiac arrest in response to an emergency call from a member of the public, who may be feeling anxious or fearful.
- Initiate telephone CPR guidance (T-CPR). The call handler must try to ensure that the caller or bystander rapidly begins chest compression. This may mean persuading someone who has had no training in CPR.
- Task/dispatch appropriate resources.
- Map assets. Call handlers need access to up-to-date and accurate information about available resources including Scottish Ambulance Service (SAS) assets and other available first responders, and the locations of public access defibrillators.

B. CPR (CARDIO-PULMONARY RESUSCITATION)

Evidence shows that the earlier chest compressions are started following cardiac arrest, the more likely it is that the person will survive. Evidence also shows that these compressions need to be uninterrupted and of best possible quality.

Aim: To increase the rate of bystander CPR.

Aim: To equip an additional 500,000 people with CPR skills by 2020 creating a nation of life savers.

4. Public

Our aim is to increase the incidence of bystander CPR, through a clear program of community engagement, information and education.¹⁹ This will require a wide range of organisations and stakeholders to play their part to raise awareness and provide good quality CPR training.

We know that knowledge and skills in CPR is not evenly distributed throughout the population which means that more effort will need to be directed towards more deprived communities. The section on 'Health Inequalities' explores these issues in more detail.

Our goal must be to shift public attitudes so that taking action in such situations becomes the norm and the knowledge that early and continuous chest compression is a vital and effective thing to do to save a life is generally understood. How this cultural shift might be achieved is described further in the 'Public attitudes' section.

As well as working to improve the capture and reporting of data on whether bystander CPR has been performed at OHCA's, we aim to measure the number of people undertaking CPR training and the percentage of the population who have had some training in CPR. The British Heart Foundation have agreed to help explore how we can gather robust data on these measures.

5. Scottish Ambulance Service

The first task is to ensure that the closest available CPR-trained responders are despatched to an OHCA to support the caller/bystander. Experience tells us that better results are achieved when three or more people are available to give CPR, and particularly where expert co-ordination can be quickly on scene.

6. Assets

There is scope to increase the availability and utilisation of relevant public services in the response to OHCA, deployed by and working alongside the ambulance service. However, this development needs to be supported by a well-governed training package for public sector responders.

There is a need to capture and feedback the impact of these organisations' contribution to survival through the audit supporting the Registry.

In many countries the fire service plays an important role in the response to OHCA. Building a closer working relationship between SFRS and SAS could lead to a transformational change, bringing major benefit to those suffering OHCA and which could quickly make Scotland an area of best practice for joined-up public services in this area. The Scottish Government strongly encourages this major change in the relationship between SAS and SFRS for the benefit of the people of Scotland.

In Scotland, the HM Fire Service Inspectorate report on 'Emergency Medical Response and the Scottish Fire and Rescue Service',²⁰ published in October 2014, highlighted the opportunities for the Scottish Fire and Rescue Service (SFRS) to work more closely with SAS and contribute to the provision of emergency medical response. As part of their normal working arrangements, it is expected that the Inspectorate will revisit their report in due course.

Some public services are already engaged in local resilience building, including in 'hard to reach' communities. There is scope for appropriate groups (such as SFRS) to test the potential to add CPR training to this work.

A number of third sector organisations are currently engaged in CPR training in Scotland. Standardisation and strategic coordination of these training endeavours would enhance their impact.

The British Heart Foundation have for a number of years sought to help and support schools to improve the teaching of CPR skills. In 2014, the BHF launched its 'Nation of Lifesavers' campaign with the aim of ensuring no young person leaves schools without knowing how to save a life.²¹ The BHF has committed to ensuring that by 2020, all secondary schools in Scotland will be equipped to teach CPR and public access defibrillator awareness.

BOX 5

Community Resilience

Community resilience is the ability of communities to help themselves and to do so as part of an integrated network of support and care appropriate to their needs.

Central to community resilience for OHCA are community first responders – members of the public who volunteer to help their communities by responding to medical emergencies while the emergency services are on their way. Community first responders are trained in a wide variety of skills including CPR and defibrillation.

For the Scottish Ambulance Service the focus of Community Resilience is on:

- Supporting and strengthening the ‘Community First Responder’ networks across Scotland. Currently, SAS has 128 Community First responder schemes across Scotland, involving over 1,200 individuals.
- Engaging with partner organisations to enhance education and training for co-responders and where necessary for the public.
- Developing systems to ensure that best use is made of Public Access Defibrillators.

In order to reinforce the work of SAS, there is scope to increase the involvement of other emergency services (such as SFRS) and third sector groups. In addition, there are a wide range of organisations, initiatives and groups operating at different levels which have an interest supporting community resilience, through promoting individual awareness and resilient behaviours, encouraging and co-ordinating volunteering, and through community level emergency planning groups. For some of these groups, health issues and responding to the medical emergencies of individuals are not their core purpose. However, there are opportunities to improve communication and networking amongst these them in order to explore the potential for CPR skills to become more widely available through for example, the Local Authority Resilience Group Scotland (LARGS), local Community Planning Partnerships, Community Safety Partnerships and community led initiatives such as Neighbourhood Watch Scotland.

C. DEFIBRILLATION

Defibrillation works in synergy with CPR and is most effective the earlier it is performed. The goal of getting a defibrillator to someone as quickly as possible will be achieved by ensuring that paramedics and others equipped with a defibrillator are rapidly deployed and by making best use of Public Access Defibrillators (PADs).

Aim: To rapidly deploy available assets which routinely carry defibrillators – ambulances and others where appropriate such as Scottish Fire and Rescue Service (SFRS) and Community First Responders.

Aim: To put in place effective arrangements to ensure that Public Access Defibrillators (PADs) are mapped, maintained and accessible to the public.

7. Public

There is a need to increase public awareness of the existence and possible availability of Public Access Defibrillators (PADs) and then to increase the instance of bystander defibrillation as part of the earliest possible approach to resuscitation. An important part of the message to the public is that modern PADs are both easy and very safe to operate.

The value and likely use of defibrillators bought for and by the public can be significantly increased by involving SAS to provide information and advice about defibrillators (e.g. type of defibrillator, siting, maintenance, usage, mapping onto ACC).

BOX 6 – AMBITIONS FOR 2020

Improved Public Response to OHCA

- Many more people who witness an out-of-hospital cardiac arrest possess the **skills and confidence** to know what to do.
- **Training in the use of CPR** is more readily available through schools, work places and voluntary groups.
- **Public Access Defibrillators (PADs)** are more easily accessible and more people have an understanding of what they are for and a greater willingness to use them.
- **It is the norm** for families, friends and even strangers to take prompt and effective action when faced with an OHCA.

8. Scottish Ambulance Service

It is crucial to get a defibrillator to the person having an OHCA as quickly as possible. Beyond SAS's own assets, SAS need good information about other trained responders who can attend with a defibrillator.

There are many thousands of defibrillators in place across Scotland. However, this information is not centrally held and importantly not consistently available to ACCs which would allow call handlers to direct a bystander to access an available PAD (which might be close by, but not immediately visible).

The British Heart Foundation is committed to supporting the Scottish Ambulance Service to map the location of public access defibrillators across Scotland and the charity is funding a study to identify the challenges associated with doing so and how to overcome them.

BOX 7 - OUR COMMITMENT: SCOTTISH AMBULANCE SERVICE

Public Access Defibrillators (PADs)

In order to support and improve the effectiveness of the use of PADs in Scotland:

- We will ensure effective governance arrangements for the mapping and maintenance of PADs and consider how best to encourage owners, purchasers and suppliers of PADs to ensure that PADs placed in the community are regularly serviced and maintained and registered with SAS.
- We will ensure that a register of PADs - mapped to the ACC - is developed and kept up to date.
- We will review the public information available about PADs, (including purchase, maintenance, location, access and signage).

9. Assets

In order to make best use of all available defibrillators they need to be appropriately located, properly maintained and mapped to the ambulance control centre.¹⁹ Enhancing the governance arrangements operated by SAS will help to ensure that public access defibrillators remain safe and sustainable.

BOX 8 - OUR COMMITMENT: POLICE SCOTLAND

OHCA Improvement Programme

- We will continue to ensure that all Police Officers attend an annual Scottish Police Emergency Lifesaving Saving (SPELS) Course, which includes training in CPR.
- We will increase the number of officers and staff trained in First Aid at Work, an enhanced course which also includes the use of defibrillators.
- We will introduce and pilot an online defibrillator awareness package.
- We will consider with SAS whether Police defibrillators can be mapped onto the SAS database.
- We will complete our review of the availability and use of defibrillators in Police custody areas and vehicles (including Roads Policing Units and Armed Response Vehicles) with the aim of enhancing the contribution of Police Officers in the response to OHCA calls.
- We will promote enhanced community resilience through our membership of local Community Planning Partnerships, Community Safety Partnerships.

BOX 9 – OUR COMMITMENT: SCOTTISH FIRE AND RESCUE SERVICE

OHCA Improvement Programme

- We will integrate health awareness such as cardiac arrest risk factors and provision of CPR training within our prevention work including our Home Safety Visits.
- We will offer our network of Fire Stations as locations for training members of the public and voluntary groups in CPR and if appropriate will enable our staff to become CPR trainers.
- We will work closely with SAS to pilot a SFRS response to OHCA in agreed geographic areas, learn lessons from the pilot and expand as appropriate.
- We will work closely to ensure all our defibrillators are mapped on to the SAS database and are placed in locations where evidence suggests they can add most value.
- We will agree appropriate and validated training for SFRS responders with SAS under the ethos of shared clinical governance.
- We will work with SAS to assess how we can support Community First Responders and promote enhanced Community Resilience.
- We will ensure that our workforce and their representatives form part of the planning and implementation to support the OHCA strategy.
- We will aim to train 100% of our support staff in CPR.

D. PRE-HOSPITAL RESUSCITATION

The principles of pre-hospital resuscitation are that CPR, defibrillation, airway management, appropriate drug therapies and other interventions will be delivered rapidly in accordance with established resuscitation guidelines for best practice.

Aim: To ensure high quality resuscitation is delivered consistently in the pre-hospital care environment.

Aim: To ensure that patients – either during or after cardiac arrest – are taken to a location with appropriate post cardiac arrest care.

After OHCA it is essential that timely pre-hospital resuscitation is carried out by a sufficient number of appropriately trained rescuers. Ideally, bystander CPR will be started immediately after OHCA in order to buy time until additional help can arrive.

Experience shows that a minimum of three rescuers are required to deliver optimal pre-hospital resuscitation after OHCA. In addition, team training in non-technical skills as well as excellent technical skills, improves performance. Skills atrophy is a problem and the use of real-time CPR quality feedback during resuscitation can help mitigate this. Regular refresher training is essential. Where appropriate, the addition of a specialist ‘second-tier’ OHCA emergency responder with additional training can improve outcomes.

BOX 10

The Sandpiper – Wildcat Project

Although the component parts of the Chain or Survival are always the same, the methods by which these parts can be delivered will vary depending on the nature of the community being served and the resources available.

The Sandpiper-Wildcat project is a proposed regional quality improvement initiative in Grampian. The Sandpiper Trust are currently fundraising to support a project team harnessing the expertise of BASICS Scotland, SAS, and the Resuscitation Research Group in Edinburgh to develop the principles from the RRG’s very successful Edinburgh 3RU project and apply them to rural Scotland.

Box 10 continues on next page

The aims are:

- Maximise community readiness to undertake bystander CPR by innovative community education in partnership with BHF.
- Timely identification of cardiac arrest, rapid deployment of appropriate resources and encouragement of earliest possible bystander CPR by Ambulance Control.
- Availability of pre-hospital resources will be augmented by development of trained and equipped first responders.
- Novel training and re-training techniques will allow the positioning of skilled first responders in the most strategic locations.
- Earliest possible defibrillation. Wildcat will feature the first regional deployment of 'smart' defibrillators, able to communicate wirelessly to ensure constant readiness and facilitate usage data collection (including resuscitation quality metrics).
- Advanced Resuscitation led by Scottish Ambulance Service.

The goal of this proposed two-year project is to develop a system which will save up to 50 additional lives each year in Grampian.

10. At scene

Outcomes from OHCA are improved by ensuring that the right number of appropriately trained and equipped people are available to effectively carry out resuscitation. Real time CPR feedback is very useful for maintaining the quality of CPR performance. This requires audit data on resuscitation quality to be routinely collected and used to highlight training needs.

It is important to minimise inappropriate resuscitation. This requires the early identification of cases where an anticipatory DNACPR decision has been documented, or where people are 'obviously dead' and beyond help.

The goal is to improve the overall response to and outcomes for OHCA but at the same time to reduce the number of inappropriate resuscitation attempts. Figure 6 below illustrates the change in profile in survivors and resuscitation attempts of successfully implementing this approach. The Registry will allow the impact of these changes to be measured.

Figure 6: Improving outcomes and the appropriateness of resuscitation attempts ²²

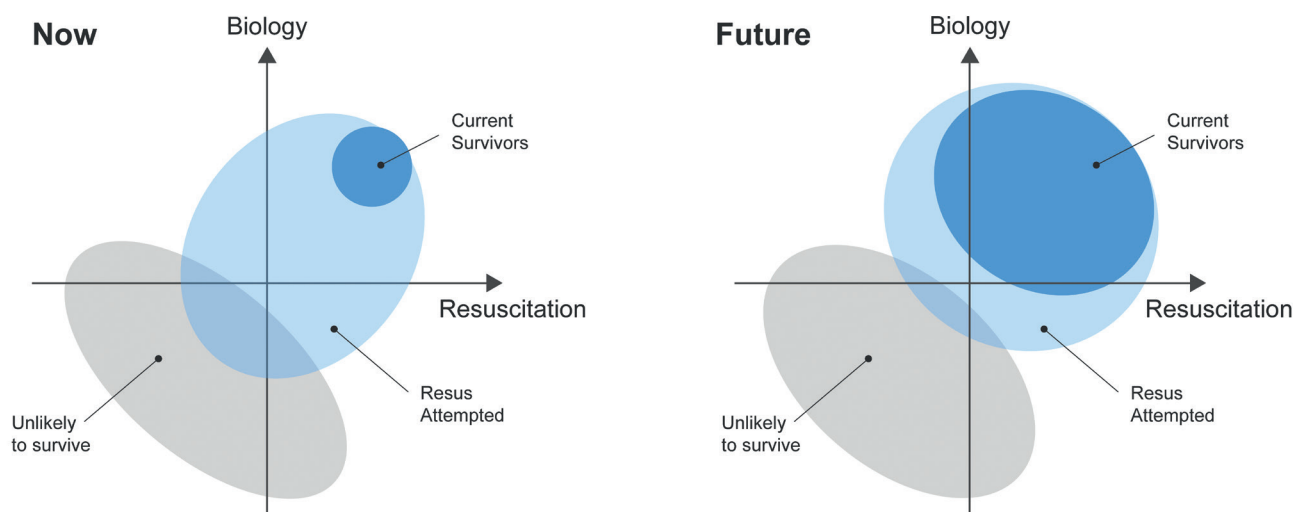


Figure 6 shows patients suffering OHCA plotted on two axes. The 'Biology' axis represents the patient's pre-existing state of health and includes factors such as advanced age and pre-existing life limiting diseases (e.g. severe heart failure, severe lung disease) at the bottom of the scale, to normally good health (with a sudden reversible cause for OHCA) at the top. Similarly the 'Resuscitation' axis runs from poor prognostic factors on the left (e.g. unwitnessed arrest, no bystander CPR), to optimal resuscitation on the right (e.g. prompt recognition and bystander CPR, early defibrillation). This quad matrix now divides patients into those expected to survive at the top right and those unlikely to survive in the bottom left.

BOX 11 - OUR COMMITMENT: SCOTTISH AMBULANCE SERVICE

Pre-hospital Resuscitation

The Scottish Ambulance Service will work with partners to design and deliver appropriate pre-hospital resuscitation models, responding to the challenges of geography, demographics and resources of individual communities.

- We will work with partner agencies to deliver appropriate resuscitation models.
- We will design these models to incorporate the geographical challenges, demographics and the resources of individual communities.
- We will engage and work in partnership with individual communities and other partner agencies to develop and implement these models.

11. Destination decision

It is important that patients who are transported from the scene of their OHCA are taken to the most appropriate hospital for further care. Work is required to put in place effective pathways and protocols which promote consistent best practice, but which recognise and reflect local geography and circumstances.

BOX 12

The Story of a Survivor: Getting the right help at the right time



Patient P had a sudden collapse while out shopping in a busy department store in the centre of Edinburgh. Early recognition by fellow shoppers that she'd had a cardiac arrest resulted in a prompt 999 call. The Ambulance Control call taker coached bystanders to do CPR while at the same time Dispatchers mobilised the nearest available ambulance crew and the 3RU paramedic on duty. A paramedic/ technician crew arrived quickly and

began further treatment. The 3RU paramedic arrived shortly after the first crew and helped the team to resuscitate P successfully using a series of advanced pre-hospital resuscitation techniques, including the use of mechanical CPR.

This case demonstrates that early recognition and CPR by bystanders will buy time until help arrives. In an urban setting the ambulance service respond very quickly. In this case a specialist resuscitation rapid response unit (3RU) was also able to attend to help lead the successful resuscitation attempt. It is important to ensure that the right number of appropriately skilled rescuers are dispatched to an OHCA as quickly as possible.

E. POST RESUSCITATION CARE

After the initial resuscitation phase, a complex series of interventions is required to ensure the best chance of a patient's long-term survival. This care starts pre-hospital and continues as the patient is transported to the Emergency Department (ED). After initial stabilisation and investigations patients will be referred to cardiology, intensive care and other specialist services as required. Interventions at this stage (e.g. temperature management) have been shown to make a significant difference to survival. Audit work in Scotland shows that there is a wide variation in practice in the management of OHCA even within a single ICU. There is a need to rationalise and standardise pathways of post resuscitation care across Scotland.

Aim: To ensure that patients treated in hospital following OHCA receive optimal care.

12. Emergency Department

The goal is to ensure that Emergency Departments are enabled to seamlessly provide the best possible care to patients who have had an OHCA. This will include initial stabilisation and investigation followed by prompt referral to appropriate in-patient specialties.

13. Cardiology and Intensive Care

Building on the current clinical evidence base there is a need to improve pathways of care between the pre-hospital phase and in-hospital cardiology and intensive care systems. We will need to gather more information and answer some outstanding questions (e.g. the role of PCI post-cardiac arrest) in order to define and disseminate optimal care pathways for Scotland.

There are a number of groups with an interest in this area of care (such as the Resuscitation Research Group, the Scottish Intensive Care Society, the Major Trauma Implementation Group and the National Advisory Committee on Heart Disease) and we seek opportunities to facilitate collaboration in developing improved approaches.

F. REHABILITATION AND AFTERCARE

The focus of OHCA is of course on the person who has the cardiac arrest, with the goal of seeing them discharged from hospital with their health restored. What happens after that, and what happens to those involved in the event and its aftermath has, to date, been given little attention. Although the available evidence about this area of care is limited, we are clear that we need to do better.

Aim: To ensure that post event care and support is available to patients and their families/carers after OHCA.

Aim: To ensure that bystanders and others impacted by OHCA are supported after the event.

14. Survivors and their families

The principal aim of any OHCA strategy must be to increase survival. However, the desire to preserve life must not outweigh the need to sustain the 'quality' of the life saved. An appreciation of the perspectives of survivors, their close family and friends and those who have lived through the loss of a loved one is essential to guide and shape the provision of care.

To inform the strategy, Chest Heart & Stroke Scotland (CHSS) brought together a small focus group to explore the needs of survivors. A literature review was also conducted and used to identify new areas of interest. The initial work has helped to define our ambitions for 2020, in relation to improving the care of survivors and their families.

BOX 13 – AMBITIONS FOR 2020

Better Care for Survivors and Families

- People who have survived a cardiac arrest and their families are offered individually tailored **high quality information** about their underlying condition and the potential physiological, psychological and social impact of cardiac arrest.
- Timely and appropriate care and advice is made available to the families of those who do not survive to discharge. This should include where possible, an explanation of the underlying cause and referral of family members to screening services where necessary.
- All survivors are offered a formal **systematic assessment** of their needs, using validated and clinically appropriate methodology.
- Assessments are conducted within the **early post-discharge** phase, within an environment which is conducive to effective communication.
- Survivors are offered **personalised support** to meet their needs, including referral to specialist services, such as cardiac rehabilitation as appropriate.
- Survivors and their families are offered opportunities for **peer support**.
- Additional information and support is provided to those requiring further investigation and/or therapeutic interventions, e.g. implantable cardioverter defibrillator (ICD).

Achieving our ambitions set out in Box 13 will not be accomplished through a single intervention or service, but will require sustained, coordinated and collaborative working between public and voluntary organisations across Scotland.

15. Those affected by OHCA

An out-of-hospital cardiac arrest can have an impact on many people beyond the individual whose heart has stopped. Those who witness the event, those who resuscitate the individual and family members can all be profoundly affected.

G. CULTURE AND CONTEXT

This section draws together requirements and actions from across the other elements of the 'augmented chain of survival' in order to ensure that implementation of the strategy maintains an appropriate focus on these issues.

16. Registry - Data and reporting

Comprehensive data collection is widely recognised as an essential foundation to the systematic improvement of OHCA outcomes.

Aim: To collect, analyse and report accurate and complete data on OHCA in order to inform decision making and improve outcomes after cardiac arrest.

An OHCA Registry will link existing datasets to form a longitudinal patient journey for each OHCA victim and allow analysis of the patient-specific and system-specific factors influencing survival. This is vital in order to benchmark the performance of our existing system of OHCA care, identify strategic areas for improvement and demonstrate the impact of system change. This type of database will require collaboration between ISD, SAS and academic partners. Annex A describes in more detail the component parts of the Registry.

The Registry will also provide the authoritative means by which Scotland will be able to publically report progress towards improved OHCA outcomes.

BOX 14

Measuring the process and outcomes of OHCA

There are a range of measures which we would want to report in order to support improvements in OHCA. The Registry will provide the mechanism to enable these data to be comprehensively and accurately collated and analysed. Measures to be developed and reported include:

- Percentage of ROSC (Return of Spontaneous Circulation) for all OHCA where resuscitation was attempted and initial rhythm was VF (Ventricular Fibrillation)
- Number of PADs mapped onto SAS CAD system
- Number of Co and First Responders mapped onto SAS CAD system
- Number (and %) of OHCA where T-CPR offered
- Number (and %) of OHCA where bystander CPR recorded
- Number (and %) of OHCA where closest first or co-responder was dispatched
- Number (and %) where a PAD was used
- Number (and %) of OHCA where a paramedic was in attendance
- Number (and %) of OHCA where three or more responders were at scene
- Survival rate – Number (and %) of people having a OHCA where resuscitation was attempted who survive to discharge

17. Clinical data

The collection of high quality data about cardiac arrest is important both in terms of clinical care and for what can be derived from the data subsequently including audit, feedback, training, and research.

Aim: To improve and simplify the capture of data by SAS to support clinical care and contribute to the cardiac arrest registry.

Ambulance staff attending OHCA are the people directly responsible for capturing the data on the processes and outcomes associated with OHCA performance. SAS recognise that more can be done to develop its capacity to capture, analyse, interpret and share data with their staff and with appropriate partners in order to drive improvements in performance and outcomes for patients. In order to achieve this, SAS is currently reviewing the accuracy and use of its 'OHCA dashboard' which includes:

- Number of crews and resources dispatched to OHCA
- Response times
- Numbers where bystander CPR and/or PADS are used
- Percentage of pre-hospital ROSC rates

The ease of use of data input, extraction and use are critical in order to help busy staff to consistently and accurately collect the necessary data. These are key considerations in any revisions or procurement of the Electronic Patient Report Form (ePRF) system and defibrillators.

18. Health Inequalities

It is known that people in deprived communities are more likely to suffer from cardiovascular diseases and OHCA but also less likely to survive than people from more affluent areas. It is essential that in improving OHCA outcomes there is a focus and commitment to addressing health inequalities so that the gap in OHCA outcomes between the most deprived and more affluent areas is narrowed.

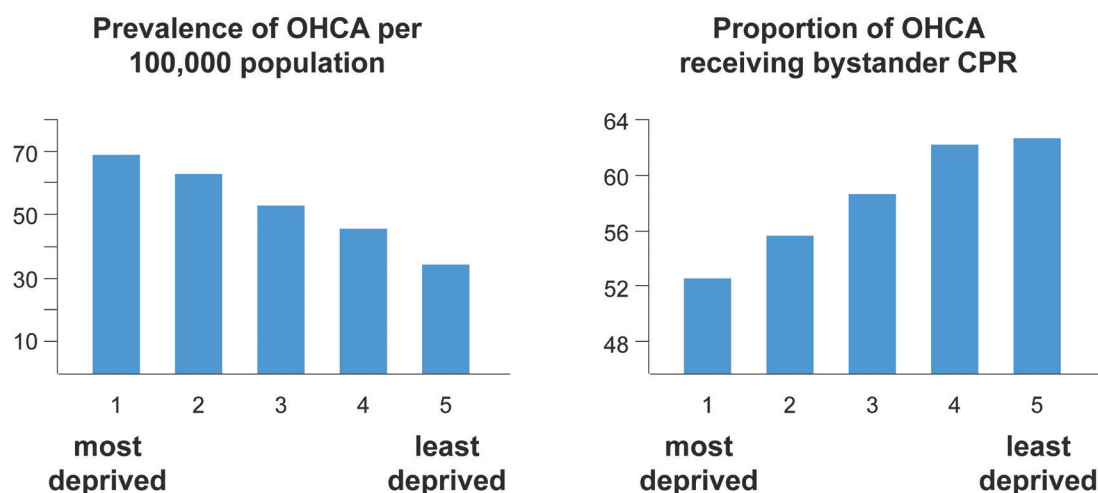
Aim: To reduce inequalities in survival after OHCA.

Aim: To strive to ensure that communities in remote and rural locations have equity of treatment for OHCA.

There is need to consider the full spectrum of factors impacting on OHCA outcome inequality including deprivation, ethnicity, gender and geography. For example, significant numbers of the Scottish population live in areas where geography presents a significant challenge in terms of ambulance response times,²³ therefore requiring the development and delivery of rural – and also remote – pathways.

There is scope for all the supporting partners of the OHCA strategy to explore opportunities to engage with disadvantaged communities to strengthen their awareness of and response to cardiac arrest and its causes.

Figure 7: Prevalence of OHCA, likelihood of receiving bystander CPR and level of deprivation, 2011/12



These graphs (based on unpublished data from the RRG) show OHCA across the whole of Scotland in 2011/12 and shows that the prevalence of OHCA increases with the level of deprivation, but the likelihood of receiving bystander CPR is inversely related.

The OHCA strategy presents an opportunity for both the SAS and SFRS to position themselves as a health promoting and health protecting organisation. An understanding of the crucial importance of addressing 'health inequalities' as part of this strategy is acknowledged by SAS and this will inform their plans to improve survival in the communities they serve.

19. Public attitudes

There is a need to engender and support a cultural shift in order to encourage and 'normalise' amongst the public the use of CPR and PADs when faced with an OHCA.

Aim: To encourage a greater public awareness of the 'right thing to do' and an increased willingness to help when present as a bystander at an OHCA.

The available evidence about changing attitudes and about social marketing has to date not been well applied in relation to responding to OHCA. Initial social research has been commissioned by the Scottish Government to better understand knowledge, attitudes and behaviour around responding to out-of-hospital cardiac arrest and help inform strategies to address barriers to implementing the new strategy.

Around 80% of cardiac arrests occur at home yet a survey carried out by the British Heart Foundation showed that the majority of people (61%) would not feel confident in performing CPR on a family member or a loved one.²⁴ This is in part due to fear of doing more harm than good and a lack of knowledge and skills. The same survey found that over half (56%) tended to look to others to take the lead during a medical emergency.

It has been suggested that some people are deterred from intervening in an emergency, for example from initiating CPR, out of concern that they may cause harm, or be sued. Although we have not found any examples of anyone in Scotland facing legal action for negligence or causing harm after seeking to provide help in an emergency, there have been calls that Scotland should follow the Westminster Government which recently passed the Social Action, Responsibility and Heroism Act 2015 for England and Wales. The need and value of a 'Good Samaritan law' in Scotland should be considered.

There is also a need to continue to shift prevailing attitudes to health more generally to highlight the public health messages that encourage people to address the preventable risks factors which can contribute to a cardiac arrest.

20. Culture of excellence

OHCA is time critical and demands that paramedics and others involved are skilled and motivated to deliver high quality care. This objective in a high pressure situation can only be achieved by attention to training and education, skill-mix and deployment models and reflective use of high quality data.

Aim: To engender the belief amongst staff and members of the public that with effective action, OHCA can be a survivable event.

It is vital that clinicians and those responsible for planning services understand that, with better planning organisation and delivery of care to patients who experience OHCA, we can ensure that more people survive and continue to live a fulfilling life. One challenge to improving survival from OHCA is to change hearts and minds – ensuring a positive mindset and approach. One way of achieving this cultural change is to set clear ambitious targets and aspirations as set out in this strategy. By creating the right conditions many more patients will survive to lead normal lives. This cultural shift must accompany the implementation of any change in process.

There is a need for clear definition of best practice and feedback on performance for all staff involved in the chain of survival – from ACC to ICU – in order to drive improvement and foster a culture of excellence. Post resuscitation debrief and post-event support are also important to as part of the feedback process and as mechanisms to protect staff wellbeing.

Effective training is central to the development and sustainability of a culture of excellence and all those engaged in responding to OHCA need to be able to access high quality training. We therefore propose to set up the ‘STAR academy’ – Scottish Training in Advanced Resuscitation – to be developed by all of the partners involved in resuscitation across the Chain of Survival. The STAR Academy will develop, promote and deliver all aspects of education and training to support professionals, ACC staff and other partner agencies to deliver world class care for patients experiencing OHCA. Training will encompass skills, drills, non-technical performance and systems of care. Particular emphasis will be given to a whole system approach and high quality ‘training for the trainers’ of all types of responder involved in OHCA.

BOX 15 – OUR COMMITMENT: SCOTTISH AMBULANCE SERVICE

Staff Support and Welfare

SAS and aligned staff often work under the most significant pressure, in all environments, to deliver care to people facing extremely difficult circumstances. It is a job that can take a physical, psychological and emotional toll.

- We will improve our processes to ensure that staff are supported through the challenging experiences they face.
- We will put in place feedback mechanisms for all staff involved in OHCA to inform them of outcomes, of their own performance and provide appropriate recognition and support.

21. Research and Innovation

Scotland needs to use – and add to – the science, research and innovation around OHCA. This will include ensuring that Scotland is equipped to recognise, assess, and where justified, implement the latest clinically proven and cost effective innovations.

Aim: To develop and maintain an environment which supports innovation and research leading to improved outcomes in OHCA.

The Scottish Ambulance Service aspires to be a world-leading organisation in research and development relating to pre-hospital care. The OHCA strategy offers an opportunity for SAS to develop the resources to provide international leadership in improving systems, processes and outcomes relating to OHCA for the benefit of the people of Scotland and beyond.

Technology around OHCA continues to evolve and it is important that Scotland can efficiently and effectively adopt and promote new technologies when it is appropriate, and cost effective to do so. As a keen participant in the national 'Innovation Champion's' network, SAS already seeks to utilise emerging technologies to improve processes in all areas of supporting the 'Chain of Survival'.

Research and innovation is required across the whole chain of survival as many important questions currently remain unanswered. Examples include - how do we increase the efficiency of interactions between the initial bystander and ACC, or understand better the impact of OHCA on patients, families and rescuers. Additionally, training teams for effective pre-hospital resuscitation is currently undergoing a renaissance with the increasing recognition of the importance of non-technical skills and the utilisation of novel approaches such as pre-hospital ultrasound scanning and mechanical CPR. The international Cardiology community acknowledges that further research is urgently required to answer important questions re the role of immediate PCI after OHCA. In addition, there is currently no evidence based international consensus on the optimum management of patients in the ICU after OHCA. This is particularly evident when attempting to identify which patients will benefit from prolonged ICU care and which will not.

Scotland has the opportunity to lead the international community by initiating work to answer these key questions in OHCA care and treatment.

In order to fulfil the ambition of becoming an international leader for OHCA outcomes Scotland will require a knowledge and improvement hub in order to build and sustain engagement and commitment as well as support and drive innovation.

International experience suggests that a successful model for this is the establishment of a 'Resuscitation Outcomes Consortium'. This would provide infrastructure and project support for clinical trials and other outcome-oriented clinical research in the area of out-of-hospital cardiac arrest. The OHCA registry provides the foundation to systematic improvement and would be a central component of such an enterprise which is described in more detail in 'BOX' 16 below.

BOX 16

Scottish Resuscitation Outcomes Consortium: A vision for the future

In order to ensure ongoing improvements in OHCA outcomes, there is a need for a collaborative hub in Scotland around which ideas can be developed, research progressed, data analysed, information shared and support and expertise offered. Based on the experience in other countries, it is proposed that a consortium – the Scottish Resuscitation Outcomes Consortium (or Scot-ROC) – should be developed.

- To work with key partners to put in place the ethical, data protection, statistical and IT frameworks required to assemble key datasets required to analyse systems of care, identify strategic research areas and drive quality improvement.
- To provide infrastructure and project support for clinical trials and other outcome-oriented research into cardiopulmonary arrest that will rapidly lead to evidence-based change in clinical practice and pathways of care in Scotland.
- To maintain a focus on pre-hospital and early hospital based emergency interventions recognising the critical importance of this time frame and the common challenges of data collection, research and service improvement in these clinical domains.
- Scot-ROC investigators could conduct collaborative trials and tests of change of variable size and duration leveraging the combined power of the member institutions and promoting the rapid translation of promising scientific and clinical advances for the public good.
- Scot-ROC would report regularly with information available to stakeholders, Scottish Government and the general public, present at relevant meetings and publish in the peer reviewed literature. The consortium could also act as an advisory group for Scottish Government and other organisations.

DRIVING AND SUSTAINING IMPROVEMENT

LEADERSHIP AND GOVERNANCE

The ambition to make Scotland an 'International Leader for OHCA Outcomes' demands clear and effective leadership at all levels to ensure that the complex range of aims and actions are designed and delivered by a wide range of stakeholders across the whole country. This will require a shared understanding and commitment to the overarching strategic aims of the strategy and its components. Effective delivery will require contributions from the public sector, academia, third and voluntary sectors and crucially from communities themselves.

In order to provide governance and co-ordination of the OHCA Strategy, the Scottish Government will continue to host a Reference Group to bring together the leaders of the main stakeholder groups. This group, chaired by the Director-General for Health and Social Care, will meet to maintain an overview of progress and help to ensure a continuing national focus on OHCA. The Reference Group will be supported by an OHCA Strategic Delivery Group which will further develop the themes and proposals set out in this strategy and be responsible for co-ordination, information sharing and reporting.

However, central to the success of our aim to change the system and improve outcomes of OHCA will be the commitment and drive of the national and local groups and organisations – and the people within them – who have a role in responding to OHCA.

MEASURES AND MONITORING

The monitoring, effective use and also the public reporting of performance and outcome data will be a key driver of the implementation of the strategy. The OHCA Registry and an appropriate mechanism to ensure that the data within it is effectively captured, quality assured, analysed and used is central to this. Work to develop the Scottish OHCA Registry is already in hand and it is hoped that it will be fully operational during 2016.

A subset of measurable objectives will be developed to demonstrate progress towards the strategic aim. These objectives will be locally applicable but will also be matched against internationally agreed comparators in order to objectively evidence our international position.

COSTS AND BENEFITS

There are of course costs as well as benefits to seeking to improve Scotland's response to OHCA. However, little has been published on the cost effectiveness of addressing OHCA and the health economics case around OHCA is rather limited. It is also difficult in the context of a complex, multi-organisational system, to easily calculate the net additional costs of improving OHCA given that it is not clear at this stage what proportion of the proposed improvements might be absorbed through different and more effective use of existing resources. Or what efficiencies might be achieved through better co-ordination amongst stakeholders.

Having agreed to the principle that Scotland can and should improve our OHCA outcomes, stakeholders individually and in collaboration need to continue to develop their improvement programmes to determine how best to take forward the necessary actions.

Quite rightly, the focus must be on the benefits to patients and their families. Our aim that by 2020 some 300 more lives will be saved every year (compared to now) is ambitious, important and achievable.

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21	British Heart Foundation, Nation of Lifesavers. https://www.bhf.org.uk/heart-health/nation-of-lifesavers.aspx
22	Resuscitation Research Group, Edinburgh 2014
23	The Scottish Government Urban Rural Classification subdivides the population into: Large Urban Areas (39.1%); Other Urban Areas (30.4%); Accessible Small Towns (8.7%); Remote Small Towns (3.7%); Accessible Rural (11.6%); Remote Rural (6.5%). 'Accessible Rural' is defined as areas with a population of less than 3,000 people and within 30 minutes drive of a settlement of 10,000 or more. In 'Remote Rural' areas the drive time is over 30 minutes
24	YouGov online poll commissioned by British Heart Foundation. Total sample size was 2,072 UK adults. Fieldwork was undertaken between 12-14 September 2014. All figures have been weighted and are representative of all UK adults (age 18+).

ANNEX A

DATA TO DRIVE IMPROVEMENT: ESTABLISHING A SCOTTISH OHCA REGISTRY

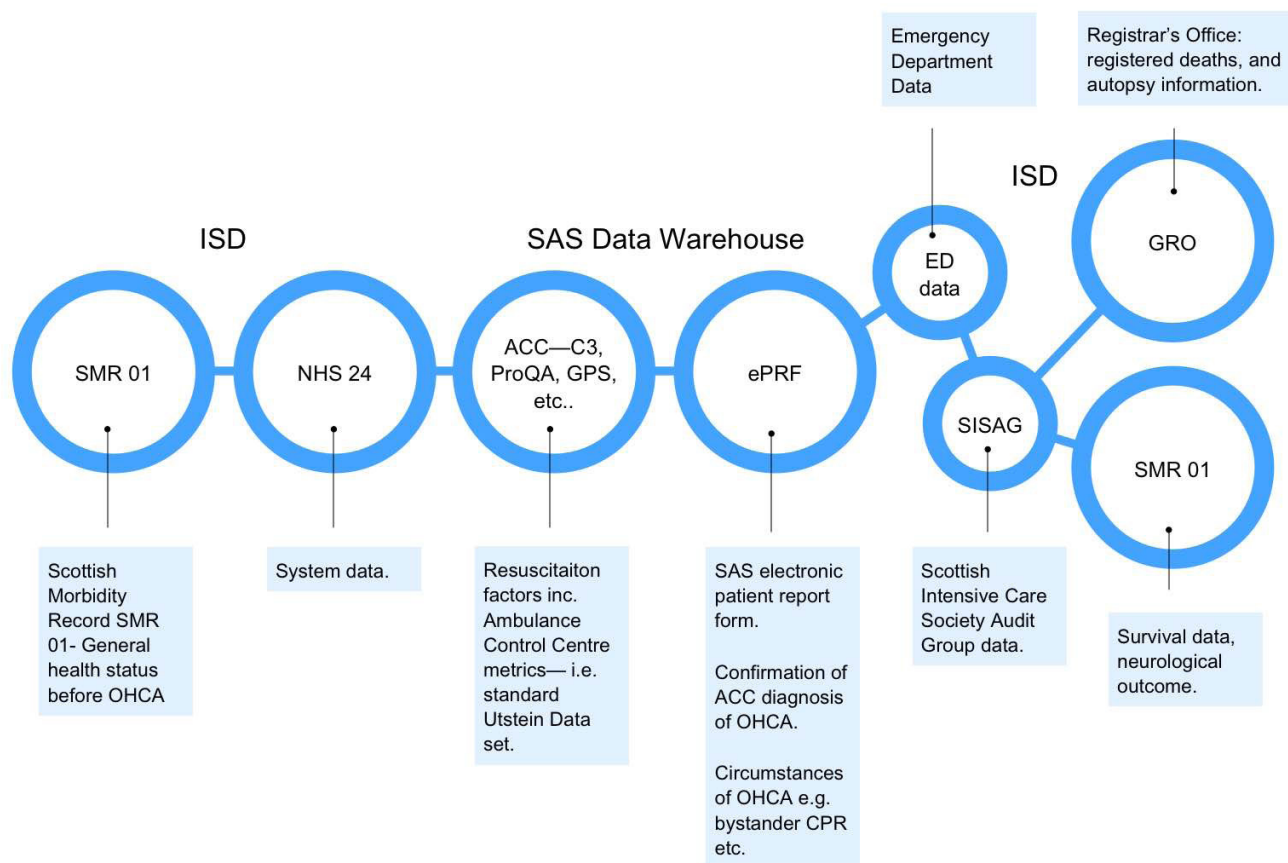
Improving OHCA outcomes and delivering and monitoring the many components of a comprehensive OHCA strategy requires a whole-system approach and will require significant improvements in the availability of high quality, timely and comparable data. Consequently, one of the key objectives of this strategy is the creation of an OHCA Registry.

Once established, in addition to the benefits of healthcare professionals being able to access better data to support patient care, the registry will allow the development of a raft of short- and long-term indicators to assess and drive improvement. This will support on-going improvement of services, but also provide the information needed to assess the progress of the strategy and the aims within it.

There is also evidence that providing meaningful feedback of performance data motivates staff to ensure that data capture is comprehensive, thereby ensuring that the information becomes more accurate and more useful.

Although a great deal of data is already collected and available it has to date not been systematically collated, analysed and used for OHCA. The Registry will link several existing data sources to form a 'patient journey' for each OHCA episode in Scotland. This linked-data will provide patient outcome figures (e.g. survival, neurological status), system benchmarking measures, and case mix data for patients suffering OHCA). By isolating fixed and alterable factors in each OHCA case, a more useful determination of targets for quality improvement will be made.

OHCA REGISTRY – THE PATIENT JOURNEY



The Registry will facilitate analysis of the full patient journey after OHCA, a journey which for some will, regrettably, end in death. However, being able to look at the underlying causes of death following OHCA, and integrating autopsy data where available, will make it easier to identify cases with a genetic component. For these cases, the registry will create an opportunity for the Familial Arrhythmia Network for Scotland (FANS) to contact families in order to investigate whether other family members carry a similar risk of cardiac arrest and so be offered preventative treatment.

The establishment of a high quality Scottish OHCA Registry brings with it the opportunity to benchmark Scottish performance against that of other countries. It is important that Scotland builds strong links with other UK and international OHCA databases.

ANNEX B

CONTRIBUTION OF THE SCOTTISH AMBULANCE SERVICE

The Scottish Ambulance Service (SAS) is central to the delivery of high quality pre-hospital care and to improving OHCA performance and outcomes. SAS has an important contribution to make across the whole Augmented Chain of Survival as a provider, co-ordinator, collaborator and enabler. The contribution of SAS runs throughout this strategy document. This annex draws together these contributions into a single list.

Readiness

- Support and enable partners and communities to ensure an effective 'assets based' approach to the response to OHCA.
- Provide a highly-trained workforce, enabled to respond to OHCA whether in ACCs or in Communities, utilising training, audit and feedback.
- Ensure co-responders (including CFRs, SFRS, BASICS) and Public Accessible Defibrillators are mapped onto ACC systems.
- Ensure appropriate information regarding prior end-of-life care decisions is made available to ambulance crew via integrated clinical IT systems.
- Further roll out 3RU in urban communities.
- Design and deliver integrated response models with SFRS and other partners.
- Work with a variety of remote/rural partners to design and deliver bespoke solutions for effective OHCA response to remote and rural communities.
- Create a climate of positivity around this crucial area of emergency response.

Early Recognition of Cardiac Arrest

- Optimise systems and training in ACCs to ensure rapid recognition of cardiac arrest.
- Rapid dispatch of resources appropriate to the location.
- Provide expert support to bystanders including T-CPR guidance to bystanders providing CPR.

Early CPR

- Ensure SAS response times are as rapid as possible and that the correct resource configuration is deployed.
- Work in partnership with others (such as BHF, SFRS) to maximise delivery of appropriate CPR training to individuals and communities.
- Maintain and extend the CFR network.
- Ensure that the crews first on scene provide CPR of the highest quality.

Early Defibrillation

- Ensure PADS are mapped onto the ACC system to increase their accessibility and availability to bystanders and so enable their rapid utilisation.
- Ensure that the crews first on scene provide rapid defibrillation where appropriate.

Post Resuscitation Care

- Further develop Advanced Life Support capacity through training and the implementation of best-evidenced care delivery.
- Implement technology-led improvements where appropriate.
- Develop and implement in collaboration with clinicians and NHS Boards the most effective patient pathways based on patient need.

Rehabilitation and Aftercare

- Enable support to SAS staff, co-responders and bystanders who are affected by involvement in OHCA.
- Collect and provide data into systems to ensure that patients/families can access appropriate aftercare.

Registry and Research

- Ensure that SAS data is robust and complete in order to optimise the understanding of outcomes.
- Report and regularly review a range of key measures of OHCA performance.
- Contribute to the development of an effective OHCA Registry.
- Respond to evidence by making system improvements and evaluating effectiveness.
- Generate and help to answer research questions to provide evidence to shape practice both in Scotland and internationally.

ANNEX C – GLOSSARY

3RU	Rapid Resuscitation Response Unit
4RU	Rapid Rural Resuscitation Response Unit
A-A	Arrhythmia Alliance - http://www.heartrhythmcharity.org.uk
AACE	Association of Ambulance Chief Executives
ACA	Ambulance Care Assistant
ACC	Ambulance Control Centre
AED	Automated External Defibrillator
AF	Atrial Fibrillation. Irregular heart rhythm
ALS	Advanced Life Support
AMI	Acute Myocardial Infarction. Medical term for a heart attack
AMPDS	Advanced Medical Priority Dispatch Software
Arrhythmia	An abnormal heart rhythm
AVLS	Automatic Vehicle Location System
BASICS	British Association for Immediate Care
BHF	British Heart Foundation - https://www.bhf.org.uk
BLS	Basic Life Support
Bystander	A lay person or non-Emergency Medical Service personnel
CAD	Computer Aided Dispatch
CCU	Coronary Care Unit
CFR	Community First Responder
CHI	Community Health Index
CHSS	Chest Heart and Stroke Scotland - http://www.chss.org.uk
COPFS	Crown Office and Procurator Fiscal Service
Co-Responder	In Scotland this refers to schemes where the Scottish Fire & Rescue Service and the Scottish Ambulance Service work in partnership to provide an effective, rapid response to immediately life threatening medical emergencies, specifically in locations where the Fire Service will be able to get to the call more quickly.
CPP	Community Planning Partnership
CPR	Cardio-Pulmonary Resuscitation. Chest compressions and breaths delivered to a person who has suffered a cardiac arrest. 'Bystander CPR' refers to CPR delivered by someone who happens to be at the scene of an out-of-hospital cardiac arrest as distinct from CPR delivered by emergency medical personnel.
CSP	Community Safety Partnership
DNACPR	Do Not Attempt CPR
ECS	Emergency Care Summary
ED	Emergency Department
EHR	Electronic Health Record
ELS	Emergency Life Support

EMERGE	Emergency Medicine Research Group, Edinburgh – www.emergeresearch.com
EMR	Emergency Medical Response
EMRS	Emergency Medical Retrieval Service – www.emrs.scot.nhs.uk
EMS	Emergency Medical Services
EPR	Electronic Patient Record
ePRF	Electronic Patient Report Form
ERC	European Resuscitation Council – https://www.erc.edu
FANS	Familial Arrhythmia Network for Scotland – http://www.fans.scot.nhs.uk
First Responder	A person who has completed a course and received certification in providing pre-hospital care for medical emergencies. They have more skill than someone who is trained in basic first aid but they are not a substitute for advanced medical care rendered by emergency medical technicians (EMTs), doctors, nurses, or paramedics.
FPHC	Faculty of Pre-Hospital Care – http://www.fphc.co.uk
GPS	Global Positioning System
GROS	General Register Office for Scotland
Heart Attack	Damage to the heart caused by a clot in the coronary arteries—requires emergency treatment in hospital.
Heartstart	A training initiative set up by the British Heart Foundation which covers a range of Emergency Life Support (ELS) Skills including cardiac arrest.
HMFSI	Her Majesty’s Fire Service Inspectorate in Scotland
ICD	Implantable Cardioverter Defibrillator. A device put inside the chest to correct Ventricular Tachycardia (VT) and Ventricular Fibrillation (VF).
ICU	Intensive Care Unit
ISD	Information Services Division
LARGS	Local Authority Resilience Group Scotland
NEJM	New England Journal of Medicine
OHCA	Out-of-Hospital Cardiac Arrest
PAD	Public Access Defibrillator
PBD	Priority Based Despatch
PCI	Percutaneous Coronary Intervention
PEA	Pulseless electrical activity. Refers to a cardiac arrest situation in which a heart rhythm is observed on the electrocardiogram that should be producing a pulse, but is not. Under normal circumstances, electrical activation of muscle cells precedes mechanical contraction of the heart (known as electromechanical coupling). In PEA, there is electrical activity, but the heart either does not contract or there are other reasons why this results in an insufficient cardiac output to generate a pulse and supply blood to the organs.
PHI	Public Health and Intelligence. Formerly called ISD (Information Services Division) – http://www.isdscotland.org
PLE	Pronounced Life Extinct
Police Scotland	Police Scotland – http://www.scotland.police.uk

PRU	Paramedic Response Unit
PTS	Patient Transport Service
QI	Quality Improvement
QALY	Quality-Adjusted Life Year. This is a concept used in assessing the value for money of medical interventions. The QALY is based on the number of years of life that would be added by the intervention and the quality of life lived.
QCPR/Q-CPR	Device designed to help the rescuer perform the most effective and consistent chest compressions on a sudden cardiac arrest victim. Also known as a 'puck'.
RDS	Retained duty system. Firefighters live and work away from their fire station and are alerted to attend emergency calls by means of a pager.
ROSC	Return of Spontaneous Circulation
RRG	Resuscitation Research Group - http://www.rrg-edinburgh.com
RRU	Rapid Response Unit
SAS	Scottish Ambulance Service - http://www.scottishambulance.com
SCA	Sudden Cardiac Arrest
Scot-ROC	Scottish Resuscitation Outcomes Consortium
SFRS	Scottish Fire and Rescue Service - http://www.firescotland.gov.uk
SGHSC	Scottish Government Health and Social Care Directorates
SICSAG	Scottish Intensive Care Society Audit Group
SIMD	Scottish Index of Multiple Deprivation
SMR	Scottish Morbidity Record
Social Marketing	Social Marketing seeks to develop and integrate marketing concepts with other approaches to influence behaviours that benefit individuals and communities for the greater social good.
SPELS	Scottish Police Emergency Lifesaving Saving
St Andrew's First Aid	St Andrew's First Aid - www.firstaid.org.uk
T-CPR	Telephone directed bystander CPR
UCD	Unscheduled Care Datamart
Utstein	Internationally recognised criteria for uniform reporting of cardiac arrest.
VF	Ventricular Fibrillation: A condition in which there is uncoordinated contraction of the heart muscle, which can potentially be corrected by early defibrillation.
WTE	Whole Time Equivalent





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