donation. Guidelines on end of life and palliative care in the ICU were recently updated by the ESICM.[528]

[h2] Long-term outcome after cardiac arrest

[h3] Long-term outcome

In settings where WLST is rare, poor outcomes because of severe hypoxic-ischaemic brain injury are common.[529,530] In contrast, in countries practising WLST, most survivors (82–91%) experience a 'good' functional outcome and return home; just 1-10% require long-term care.[529,530] At one-year and beyond, evidence suggests that general health status approximates normal population values.[531] However, such generic health assessments may lack sufficient granularity to capture the breadth of problems.[322,532] Cardiac arrest survivors often continue to experience symptoms such as memory difficulties, anxiety, fatigue and physical limitations which can impact their health-related quality of life and societal participation.[529-531,533-536] Supplementing generic assessment with condition or problem-specific assessment is therefore recommended.[322] Older age, female sex, anxiety, depression, and impaired neurocognitive function are significantly associated with poorer health-related quality of life following OHCA.[534] A registry-based study reported significantly worse health-related quality of life in IHCA (n=1369) survivors when compared to OHCA (n=772) survivors.[537]

[h4] Cognition

A recent review of neurocognitive function following OHCA highlighted the substantial heterogeneity in outcome reporting and use of different cut-points,[533] with possible cognitive impairment ranging between 0-88%. Most common impairments affect episodic memory, executive functioning, and processing speed.[533,538] Most cognitive recovery occurs within the first three to six-months after the cardiac arrest.[529,530,539]

[h4] Fatigue

Up to 70% of cardiac arrest survivors report fatigue.[529,530,540] Limited evidence suggests no significant difference in fatigue levels between 1-5 yrs after OHCA.[540] Both physical and mental fatigue is widely described and associated with cognitive deficits, anxiety, depression.[538,540] and low levels of physical activity.[541]

[h4] Emotional wellbeing

A review of IHCA and OHCA survivors described little change in the prevalence of short (<6-months) and long-term (>6-months) anxiety (22-24%) and depression (19%).[535] A further review, of OHCA survivors only, reported similar levels of anxiety (26%), depression (19%) and post-traumatic stress disorder (20%), with symptom prevalence appearing to increase over time for anxiety and depression.[536] For OHCA, age and female sex are non-significant moderators for anxiety and depression.[536] However, younger survivors (<60 years) are at a higher risk of developing depressive symptoms within six-months. [535]

[h4] Physical function

Survivors frequently experience mobility limitations over both the short and longer-term,[537,542-545] which are more common compared to both general[530] and matched cardiac populations.[542] Problems are more common in older individuals, females, and those with cognitive impairment, anxiety or depression.[542] Similarly, at six-months post-OHCA, one-third of survivors in the TTM2 trial self-reported low levels of physical activity,[543] an important cardiovascular risk factor,[546] which were more common in those who were obese or, for example, had mobility problems or cognitive impairment.[543]

[h4] Pain

Pain is reported by 21-58% of survivors at 3-6-months,[545,547,548] and in 53% of IHCA survivors at 12-months.[549]

[h4] Societal Participation and return to work

Limitations in usual activities are reported at 3-6 months,[544,547] and 12-months.[549] Up to 50% self-report difficulties performing work or other activities due to physical (50%) or emotional (35%) problems at six-months.[545] Self-reported restrictions in societal participation are greater when compared to matched cardiac patients.[550] Cognitive impairment, depression, fatigue and restricted mobility negatively affect societal participation.[550] Younger patients also report more restrictions in returning to societal activities.[551]

Approximately 50% return to previous work levels within six-months, rising to 63% with reduced hours; median return time is around 80 days.[551] Although a smaller sample size, similar percentages of return have been reported by others; for example, 42% and 55% at six and 12-months respectively.[552] Factors reducing work return include cognitive impairment, fatigue, and female sex.[550,553-555]

[h4] Family members and close friends

Family members and close friends, often referred to as co-survivors, particularly those who witness or participate in the resuscitation, commonly experience anxiety, posttraumatic stress, and sleep disturbance.[556,557] Higher acute traumatic stress in the partners of cardiac arrest survivors was associated with symptoms of post-traumatic stress at both 3-months and 1-year.[558] These symptoms were greater in partners than in survivors. Bereaved family members also experience high levels of emotional burden.[556]

[h2] Rehabilitation and follow-up after cardiac arrest

[h3] Rehabilitation during hospitalisation

Although are no ICU rehabilitation studies for cardiac arrest specifically, there are rehabilitation guidelines for post-intensive care syndrome and these recommend early mobilisation, delirium management and ICU diaries. [559,560] Early mobilisation (e.g., functional/resistance exercises) within 72 hours of ICU admission may reduce ventilation duration, length of stay, delirium and muscle strength.[559] Information on the type, dose and length of mobilization is limited and evidence for long term outcomes is lacking.

An RCT (N=750) compared usual levels of ICU mobilisation (mean 8.8 (SD 9.0) minutes/day) with increased early mobilization (mean 20.8 (SD 14.6) minutes/day).[561] Whilst there were no significant effects in any of the prespecified outcomes, the intervention group showed a trend towards more adverse events. No cardiac arrest survivors were included. A subsequent systematic review and meta-analysis report mobilisation in the ICU to be safe, and with no overall increase of adverse events.[562]

Delirium is common among cardiac arrest survivors (up to 92%).[563] Multimodal prevention strategies and assessment, as described for general intensive care patients may be relevant.[559,564] The Confusion Assessment Method for the ICU or the Intensive Care Delirium Screening Checklist are recommended assessment approaches.[559] Physical and non-physical assessments before hospital discharge are recommended.[3,559] Early screening of cognitive and emotional status to predict later problems in OHCA survivors is widely supported.[565-569]

[h3] Specialised in-patient neurological rehabilitation

In-patient rehabilitation for cardiac arrest survivors is provided within general brain injury rehabilitation programmes, informed by multiple clinical practice guidelines for different types of

acquired brain injuries, including hypoxic or traumatic brain injury and stroke.[570-572] Even small improvements may reduce the burden of care on family and society.

A review of five observational studies of in-patient rehabilitation for adult cardiac arrest survivors with acquired brain injury (N=187) reported low quality evidence of positive effects for functional and neurological outcome (standardised mean difference 0.71, 95% CI 0.45-0.96).[573] Additional observational studies of HIBI report similar findings.[574-576] Whilst worse recovery in HIBI patients when compared to other acquired brain injury groups has been reported,[575] where baseline function was similar, outcomes were not statistically different.[577] For those who are comatose or in an unresponsive wakefulness state, outcome was unfavourable, and they rarely recover.[578-580]

[h3] Cardiac rehabilitation

Many, but not all, cardiac arrest survivors are eligible for generic cardiac rehabilitation programs.[581] These typically include aerobic exercise, sometimes with addition of resistance training, for 20-90 minutes/ 1-7 sessions a week,[582] delivered at an institution, home-based or electronically.

A recent metanalysis including 85 RCTs (>23 000 patients) confirmed that exercise-based cardiac rehabilitation for patients with coronary heart disease reduces cardiovascular mortality, recurrent cardiovascular events and hospitalization; some evidence suggests cost-effectiveness and improvements in health-related quality of life.[582] Whilst there is no evidence of specific benefit following cardiac arrest, two small observational studies (N=33) included in a recent review suggest that exercise-based rehabilitation is safe for survivors and without adverse events.[573] Moreover, exercise duration (but not capacity) increased (mean difference 3.7 min (95% CI 0.5–7.0), p=0.02). Cognitive and emotional problems are inadequately addressed in traditional cardiac rehabilitation programmes,[583] and access remains limited for cardiac arrest survivors.[581]

[h3] Follow up

Based on limited evidence,[584-587] a structured follow-up including screening of fatigue, cognitive and emotional status, and information provision is suggested to identify the problems and care needs of both cardiac arrest survivors and co-survivors (Figure 8).[1,3,556] Asking about physical impairment should also be considered.[542] Information should cover both medical subjects such as cardiac disease, risk factors, medication and ICD and other topics such as potential physical, cognitive and emotional changes and fatigue, resuming daily activities, driving and work, relationship and sexuality.[3] Some useful links include: Heartsight (https://ourheartsight.com/), Sudden Cardiac Arrest UK (https://suddencardiacarrestuk.org/), and Life After Cardiac Arrest (https://www.hlr.nu/wp-

content/uploads/2022/04/livetefterhjartstopp_ENG.pdf). Whilst patient forums report on the benefit and value of peer support networks,[588] published studies on the effectiveness of such networks or virtual/online forums are not available.[589,590]

[h3] Screening and management of cognitive, emotional and physical status, and fatigue

[h4] Cognitive issues

Screening should include asking the survivor about cognitive complaints. Family members or close friends can provide useful insight. Formal screening is recommended when possible. Evidence supports use of the Montreal Cognitive Assessment (MoCA) (Table 2);[591,592] sensitivity improves when used in combination with the Symbol Digit Modalities Test (Table 2).[591] For those that screen positive, consider referral to a healthcare professional with experience in brain injury-related impairments – e.g., an occupational therapist or neuropsychologist.

Cognitive rehabilitation aims to reduce the impact of cognitive impairments on daily life.[593] Psychoeducation is an essential part of this approach. There are no studies of cognitive rehabilitation for cardiac arrest,[573] but clinical practice guidelines in other acute brain injury patients are useful.[593,594] For example, compensatory memory strategies[593,595] and metacognitive strategy training.[593,596,597] Examples of integrated cardiac and cognitive rehabilitation for cardiac arrest survivors are described but not evaluated.[583,598]

[h4] Emotional issues

The Hospital Anxiety and Depression Scale (HADS) is widely used in cardiac arrest,[535,536] but there are few psychometric evaluations of its performance in this population. [599,600] However, there is strong evidence to support the use of the Hospital Anxiety and Depression Scale in the general population and in patients with cardiac disease[601] (Table 2). Although the Impact of Events Scale-revised[558,565] and the Post-Traumatic Stress Disorders Checklist (Table 2) have been used in cardiac arrest,[567,568] evidence of psychometric properties in this population is limited. For those who screen positive, consider referral to a specialist in the management of emotional problems - e.g., general practitioner, psychologist, psychiatrist, social worker. It is also important to monitor the wellbeing of family members and close friends.[3,529,530] Emotional difficulties could be treated in line with symptom specific pharmacological and non-pharmacological recommendations.

There is limited evidence that psychosocial interventions specifically designed for cardiac arrest survivors can be of value.[573] A single RCT (121 of the 301 patients were cardiac arrest survivors) of a

social-cognitive intervention suggests that when delivered to cardiac patients and partners, a more positive impact on emotional wellbeing is reported than when delivered to patients alone.[602,603] A small study confirmed the feasibility of an individual acceptance and mindfulness-based exposure therapy delivered digitally for cardiac arrest survivors with post-traumatic stress disorder (n=11); the potential for outcome improvement was described.[604]

[h4] Screening and management of fatigue

Whilst assessment guidance in this population is lacking, the most widely used measures include the Modified Fatigue Impact Scale (MFIS),[605-608] the Multi-dimensional Fatigue Inventory-20 items (MFI-20),[538,606] and the Fatigue Severity Scale (FSS)[607-609] (Table 2). Evidence from other populations (e.g., multiple sclerosis) suggests where both mental and physical fatigue are important the Modified Fatigue Impact Scale is preferable to the Fatigue Severity Scale.[610] For those that screen positive, consider referral to specialist in fatigue and fatigue management - e.g. psychologist, occupational therapist, physiotherapist, rehabilitation medicine physician.

Limited evidence suggests that a telephone-delivered energy conservation and problem-solving therapy may benefit cardiac arrest survivors.[607,608] Clinical practice guidelines in other patient groups, may be useful;[611,612] including for example, behavioural interventions such as pacing and prioritising activities. And whilst fatigue is a survivor-reported barrier to returning to work following OHCA,[555] compensatory strategies, such as modified work tasks and flexible work hours, can be helpful.[552,555]

[h4] Screening and management of physical challenges

Assessment guidance for physical function or physical activity in this population is lacking. Whilst patient self-reports, such as those described in a recent trial,[613,614] may over-estimate the amount of physical activity engaged in,[615] they could be useful indicators of where cardiac arrest survivors could benefit from physical activity interventions (Table 2). For those reporting low levels of physical activity or limitations in physical function, consider referral to a physiotherapist or an occupational therapist.

[h3] Rehabilitation and interventions to increase societal participation and overall health-related quality of life

Comprehensive care pathways should be multi-factorial, multi-disciplinary, and tailored to an individual's needs based on the biopsychosocial model. The ultimate goals of care should support

survivors towards optimal psychological recovery, relative independence, re-integration into society and an improved health-related quality of life.

However, underpinned by the low-quality of evidence, a recent review of rehabilitation interventions was unable to determine intervention effectiveness on the secondary consequences of cardiac arrest survival including health-related quality of life and neurological function.[573] Among cardiac arrest survivors working prior to the event almost half report an unmet rehabilitation need at six-months.[552] Further high-quality studies are urgently needed.[546,573] A small pilot study (n=40) tested a residential and home-based rehabilitation programme including education, physical activity training, and psychosocial support.[573] Whilst recruitment rates were less than expected and the specialised residential component may not be feasible in many settings, patient and clinician's satisfaction was high. Initial reports suggest a positive impact on depression, disability, and life activities.

[h4] Family members and close friends

Prior to hospital discharge and at follow-up, enhanced communication with family and close friends is important to highlight 'what to expect', signpost to helpful resources including survivor/patient organisations and, where appropriate, to seek further help from, for example, a general practitioner.[556]

[h2]Organ donation

These recommendations encourage providing patients and their families with the opportunity to donate organs in the event of brain death or the decision to WLST (Figure 9). In the face of the increasing shortage of transplant organs, it is important to remember that a significant proportion of patients who will not survive cardiac arrest represent a potential source of solid organ donors. All health systems should develop, implement and evaluate protocols designed to optimise organ donation opportunities for patients who have had a cardiac arrest.

Recent CPR is not a barrier to organ donation. A recent ILCOR systematic review identified 35 observational studies of organ donation after donor cardiac arrest.[8] For all organ grafts studied (heart, lung, kidney, pancreas, liver, intestine) there was no significant difference in graft function or recipient survival with organs from donors who died after an initially successful resuscitation, compared with donors who had not received CPR.

Organ donation policies and practices vary internationally, and clinicians must respect local legal and ethical requirements. There are different pathways for patients with cardiac arrest to become organ

donors.[616] These guidelines specifically address organ donation after brain death (DBD) or controlled donation after circulatory death (cDCD: Maastricht category III donors) in patients with ROSC or who have been treated with ECPR.[617] Challenges in implementing uncontrolled donation protocols after cardiac arrest (Maastricht category I/II donors) are discussed in the ERC Guidelines 2025 Adult Advanced Life Support, and ethical aspect in the ERC Guidelines 2025 on Ethics in Resuscitaiton.[172,618]

A systematic review identified 26 studies that showed that the prevalence of brain death in ventilated comatose patients with hypoxic-ischemic brain injury who died after cardiopulmonary resuscitation was 12.6% (95% CI 10.2–15.2%), with a higher prevalence after ECPR [27.9% (19.7–36.6%) vs. 8.3% (6.5–10.4%)], and that approximately 40% of them donated organs.[317] The median time to diagnosis of brain death was 3.2 days. Patients who remain comatose after resuscitation from cardiac arrest, especially when resuscitated by ECPR, should be actively evaluated for signs of brain death. Scoring systems that may enable early detection of patients with a high probability of brain death after cardiac arrest may help increase organ donation after out of hospital cardiac arrest.[619,620] High-volume centres are more likely to refer and procure transplantable organs from patients with non-survivable OHCA.[621]

Even in the absence of brain death, some patients may be evaluated as possible cDCDs when WLST is considered. Donation after controlled circulatory determination of death is an increasingly important organ donation source. For kidneys, the proportion of cDCDs has increased from 17% to 31% in Australia between 2009 and 2019,[622] and from 21% to 46% between 2009 and 2023 in the UK.[623] However, cDCDs after cardiac arrest are probably underreported. Two recent controlled studies investigated the outcomes of organs from cDCDs after cardiac arrest resuscitation and showed that the survival of kidneys[624] or hearts[625] donated by cDCDs after cardiac arrest was not inferior to that of non-CPR donors.

Implementation of ECPR to treat refractory OHCA is associated with increased organ donation and an excellent outcome of transplanted organs.[626] Thus, ECPR has a potential to increase not only the number of survivors of prolonged cardiac arrest but also the number of organ donors.[489,627,628] The Utstein OHCA template includes organ donation as a supplementary outcome and we suggest that cardiac arrest registries report if organ donation after initial resuscitation from cardiac arrest occurred.[629]

[h2]Investigating sudden unexplained cardiac arrest

Unexplained cardiac arrest refers to cases where no diagnosis is evident after initial ECG, echocardiography, and coronary assessment in sudden cardiac arrest survivors.[630] Recent registry

data suggest that 12.3% of sudden cardiac arrest survivors had no diagnosis after the initial assessment, with higher rates observed in younger or exercise-related cases.[631 632] Further testing may identify a specific diagnosis in 41 to 61% of patients.[632,633] Possible diagnoses include primary electrical disorders like Brugada and long QT syndromes, latent genetic cardiomyopathies (e.g. arrhythmogenic RV, hypertrophic and dilated cardiomyopathies), inflammatory heart disease (e.g. myocarditis, sarcoidosis), ischaemia without atherosclerotic coronary artery disease (e.g. coronary spasm) and conduction system abnormalities.

A thorough diagnosis after unexplained cardiac arrest is important for patient clarity, tailored treatment, and identifying at-risk family members. The latest ESC guidelines standardise sudden cardiac arrest survivor evaluations before diagnosing idiopathic ventricular fibrillation and emphasise a multidisciplinary approach.[180] Recommended diagnostic testing of patients with unexplained cardiac arrest includes blood sample collection for toxicology and genetic testing, data retrieval from cardiac implantable electronic devices and wearable monitors, repeated 12 lead ECG and continuous cardiac monitoring, cardiac MRI, sodium channel blocker tests, and exercise testing.[180]

Genetic testing plays an important role in identifying heritable causes of unexplained cardiac arrest.[634] A confirmed diagnosis of a heritable condition should prompt targeted genetic testing, focusing on genes with strong evidence of causative links with diagnostic yields varying by condition (e.g., ~20% in Brugada Syndrome to ~80% in Long QT Syndrome).[180,634] However, a negative result does not rule out a genetic cause, and family screening may still be necessary. The role of genetic testing in unexplained cardiac arrest survivors without a clear diagnosis remains uncertain, with diagnostic yields up to 17% in unexplained cardiac arrest and ~10% after detailed clinical assessment.[180] Long-term follow-up of unexplained cardiac arrest patients is recommended because of the high risk of recurrence of arrhythmia (16–26%) often within the first few years. Risk is higher in those lacking a thorough initial evaluation.[635] In the absence of diagnosis at the initial phase, prolonged follow-up and repetition of investigations can help isolate a diagnosis, most often related to an electrical heart disorder.[636]

[h2]Cardiac Arrest Centres

There is wide variation among hospitals in the availability and type of post-resuscitation care, as well as clinical outcomes, which has given rise to the concept of the cardiac arrest centre as a means of providing post-cardiac arrest patients with uniform, high-quality treatment according to current standards of care.[637-639] Definitions of a cardiac arrest centre vary, but an expert consensus paper

published by the Association for Acute Cardiovascular Care of the European Society of Cardiology, European Association of Percutaneous Coronary Interventions, European Heart Rhythm Association, European Resuscitation Council, European Society for Emergency Medicine and European Society of Intensive Care Medicine, states that the minimum requirements for a cardiac arrest centre are 24/7 availability of an on-site coronary angiography laboratory, an emergency department, an intensive care unit (ICU), imaging facilities (such as echocardiography, computed tomography, and magnetic resonance imaging), as well as a network organization.[640]

ILCOR suggests that adult patients with non-traumatic OHCA cardiac arrest should be cared for in cardiac arrest centres and this recommendation had been adopted by the ERC/ESICM.[39] The weak recommendation is based on low-certainty evidence from a systematic review that used the European position paper to define cardiac arrest centres.[641] The systematic review included one RCT [642] and 15 observational studies.[643-657] Of these, 12 reported better survival to hospital discharge and one showed no difference. However, the studies were very heterogeneous, and their interpretation is problematic because all were at moderate or serious risk of bias. The one RCT was undertaken in London, UK and randomised OHCA patients with ROSC and without ST elevation on their ECGs to be transferred to cardiac arrest centre or to the nearest acute hospital.[642] There was no difference in 30-day mortality (primary outcome), but there was also little difference in the treatment provided in the acute hospitals and cardiac arrest centres.

It is likely that the optimal configuration of cardiac arrest centres will vary among different countries and regions but in many healthcare systems the trend is to regionalise the care of cardiac arrest patients in a similar way to the regionalisation of major trauma. Despite only low-certainty evidence supporting cardiac arrest centres, major European scientific organisations are general supportive of their implementation. Further details on the system behing cardiac arrst centers ar ein the ERC Guidelines 2025 System Saving Lives.[658]