Clinical paper

Predictors of long-term functional outcome and health-related quality of life after out-of-hospital cardiac arrest☆

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ABSTRACT

Background: Even if a large majority of out-of-hospital cardiac arrest (OHCA) survivors appear to have a good neurological recovery with no important sequellae, whether health-related quality of life (HRQOL) is altered is less explored.

Patients and methods: HRQOL was evaluated by telephone interview using SF-36 questionnaire. Each OHCA case was age and gender-matched with 4 controls from the French general population. Association between current condition of the survivors with the 8 dimensions of the SF-36 questionnaire was investigated using MANCOVA. Cluster analysis was performed to identify patterns of HRQOL among CPC1 survivors.

Results: 255 patients discharged alive from our referral centre between 2000 and 2013 (median age of 55y [45,64], 73.7% males) were interviewed. Global physical and mental components did not differ between CPC 1 survivors and controls (47.0 vs. 47.1, p = 0.88 and 46.4 vs. 46.9, p = 0.45) but substantially differed between CPC2, CPC3 and the corresponding controls. Younger age, male gender, good neurological recovery and daily-life autonomy at telephone interview were significantly associated with better scores in each SF-36 dimensions. Cluster analysis individualized 4 distinct subgroups of CPC1 patients characterised by progressively increased score of SF-36. Return to work and daily-life autonomy were differently distributed across these 4 groups while pre-hospital Utstein variables were not.

Conclusion: HRQOL of CPC1 OHCA survivors appeared similar to that of the general population, but patients with CPC2 or 3 had altered HRQOL. Younger age, male gender, good neurological recovery and daily-life autonomy were independently associated with a better HRQOL.

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Introduction

Q4 Due to anoxo-ischemic damages, brain injury is the most common cause of early death in patients resuscitated from cardiac arrest.[1] This is in contrast with what is observed in survivors, as a large majority of these patients appear to have a good neurological outcome with no important sequellae using common performance scales.[2] Whether health-related quality of life (HRQOL) is or not altered in these survivors is less explored, even if it is now considered as a major outcome criteria.[3] Recent data reported that a substantial proportion of cardiac arrest survivors suffer from impairment not detected previously by standard outcome scales, suggesting that a subgroup of survivors does not regain an acceptable quality of life during the longer-term period following a cardiac arrest.[4,5] In addition to the devastating impact on the patients and families' daily life, alteration in quality of life may have conse-

quences in broader socioeconomic terms, due to potential loss of productivity. Quality of life might be altered for numerous reasons in cardiac arrest survivors and identification of long term determinants of HRQOL could help to tailor interventions designed to prevent deterioration.

Anoxia-related brain injury is the most important determinant of HRQOL in survivors.[2] Due to the multiple constructs that are included in the concept of HRQOL, such as perceived health status, functional status as well as social interactions and symptoms, such an outcome should be preferred to accurately evaluate brain damage long-term consequences.[3] However the specific role of some determinants, such as recovery of daily-life autonomy and professional reinsertion, deserve investigation. In addition, it is unclear if complete neurological recovery, as assessed through common performance scales, is consistently associated with a better HRQOL. Among survivors with apparent complete recovery, there might be some heterogeneity in the pattern of HRQOL, and initial management may influence these patterns of HRQOL, if any.

By using the Parisian cohort, our aims were three fold: firstly, we evaluated the long-term HRQOL of cardiac arrest survivors and compared it with matched individuals from the general population, taking into account the level of neurological recovery. Secondly, we identified factors associated with a better long-term HRQOL. Thirdly, among survivors with apparent complete neurological recovery, we searched for the existence of different patterns of long-term HRQOL using a cluster analysis.

Patients and methods

OHCA patients' management

The pre-hospital management of OHCA patients in the suburban Paris area (France) and their subsequent in-hospital management have been previously described.[6,7] Briefly current management of OHCA patients involves mobile emergency units and fire departments. Patients in whom return of spontaneous circulation (ROSC) is achieved are then referred to a tertiary "cardiac arrest center" with an intensive care unit (ICU) and coronary intervention facilities available 24 h a day, 7 days a week.

According to our local policy, patients without an obvious non-cardiac cause of cardiac arrest are directly admitted to the cardiac catheterization laboratory, regardless of ECG findings.[7] A percutaneous coronary intervention (PCI) is performed if coronary angiography evidences an acute coronary artery occlusion or if there is a thrombotic lesions that is deemed to be responsible for the cardiac arrest. Immediate PCI meant that successfully resuscitated OHCA patients underwent coronary angiography and PCI within the first 6 h following collapse.[8] When a non-cardiac cause is suspected, a cranial tomodensitometry and/or a pulmonary angio-tomography are performed to search for a neurological or a respiratory aetiology, as previously described.[7] After these procedures, all patients are admitted to ICU for further supportive treatment. When indicated, therapeutic hypothermia (TH) is performed by targeting 33 °C during the first 24 h.[9]

Study population: OHCA survivors

The data of all consecutive OHCA patients hospitalized in our tertiary care centre between 2000 and 2013 were prospectively included in the study according to the Utstein style.[10] The following pre-hospital, in-hospital and after hospital discharge were recorded for each patient: demographic data, clinical parameters, cardiac arrest location, time from collapse to basic life support (BLS) and time from BLS to ROSC, initial cardiac rhythm at Emergency Medical Service (EMS) team presentation, carrying out of early PCI,

temperature management, vital and neurological status at ICU discharge.

Description of data was performed according to the STROBE guidelines related to observational studies reporting.[11] Our local ethics committe approved the study.

Follow-up of OHCA survivors

HRQOL was evaluated by telephone interviews starting in 2012. A trained clinical research assistant performed telephone interviews using predefined guidelines. If the patient was not capable of taking part in the interview, the research assistant was allowed to interview the patient's next of kin, since relatives have been shown to give a good assessment of daily autonomy[12] and functional aspects of HRQOL.[13,14] A standardized protocol was used for follow-up and the patient was declared lost to follow-up for interview after 3 series of 6 attempts each were performed.

We checked vital status against the National Directory for the identification of natural persons (RNIPP: *Registre National d'Identification des Personnes Physiques*) maintained by the National Institute of Statistics and Economic Studies (INSEE).

Outcomes measures

Main outcome was the HRQOL assessed by the French translated version of the Medical Outcomes Study Short-Form 36 Health Survey (MOS SF-36, v2) questionnaire,[15] which has been previolsy used with cardiac arrest patients.[5] Briefly the SF-36 provides an assessment of physical and mental HRQOL.[16] This 36-items questionnaire evaluated eight dimensions of functioning and well-being (role limitations because of physical problems ("role-physical"), bodily pain, physical functioning, general health perception, vitality, social functioning, role limitations because of emotional problems ("role-emotional") and mental health (psychological distress and psychological well-being)). Dimensions can be investigated separately but can also be combined to provide summary scores of physical and mental health, together with a total score (8 dimensions combined).[17] Scores range from 0 to 100, with higher scores indicating better health. Physical and mental component summary scales (PCS and MCS) are then computed as weighted composites of the 8 scales (physical functioning, general health, bodily pain and role physical in PCS and social functioning, role emotional, mental health and vitality in MCS).

Secondary outcomes were: vital status, neurologic performance evaluated by the Cerebral Performance Category (CPC),[18] return to professional activities, and independence in activities of daily-living assessed by the Katz index (ADL).[19] Briefly, CPC score ranges from 1 to 5: (1) good cerebral performance; (2) moderate cerebral disability; (3) severe cerebral disability; (4) coma or vegetative state and (5) death. In the present study, we defined good neurological perfomance by CPC1 and intermediate or poor neurological performance by CPC higher than 1. The ADL index ranks adequacy of performance in the six functions of bathing, dressing, toileting, transferring, continence and feeding. Participants reporting that they needed help with any of the activities (i.e. ADL < 6) were considered to have impaired ADL, as previously described.[20,21]

Reference group: the decennial survey on population health and medical services in France

As a reference group, we used the most recent decennial survey on population health and medical services involving 25,000 families conducted in France by the National Institute of Statistics and Economic Studies (INSEE) between October 2002 and October 2003.[22] Its main objective was to evaluate subjects' perspective and behaviors regarding their health. The survey involved an estimate