

Title: NEUROLOGIC OUTCOME OF SURVIVORS OF CARDIAC ARREST

Authors: N.S. Abramson, M.D., P. Safar, M.D., K. Detre, M.D., J. Monroe, B.S., S. Kelsey, Ph.D., O. Reinmuth, M.D., J. Snyder, M.D., A. Mullie, M.D., U. Hedstrand, M.D., T. Tammisto, M.D., I. Lund, M.D., H. Breivik, M.D., B. Lind, M.D., M. Jastremski, M.D.

Affiliation: Resuscitation Research Center and Department of Anesthesiology/CCM, University of Pittsburgh, Pittsburgh, PA 15260 and participating hospitals

**Introduction.** Most clinical studies of CPR have defined success rates in terms of patient survival to hospital discharge. Little information is available about long-term follow-up of cardiac arrest survivors in terms of neurologic function and quality of life. This paper presents interim results obtained from analysis of 100 patients comprising the standard therapy control group of an international collaborative randomized study of brain resuscitation (1).

**Methods.** Patients selected into the study had no purposeful response to pain 10-50 minutes after restoration of spontaneous circulation. Informed consent was documented for all study patients. All patients received protocol-defined standard therapy (2). Computerized forms were used to collect historical information as well as data on severity of brain insult, depth of post-resuscitation coma and quality of life during the one year follow-up period (2). Outcome variables determined included cerebral performance categories (CPC) and overall perf. cat. (OPC) 1 (normal), 2 (slight disability), 3 (awake, but severe disability), 4 (coma, vegetative state) and 5 (brain death, death) (2).

**Results: Demographics.** Patients were predominantly male (78%) with a mean age of 58 years (range 2-88). 79% of arrests occurred out of hospital, predominantly related to cardiac causes (77%). Pre-arrest CPC was #1 in 93%. Pre-arrest OPC was #1 in only 57%, primarily related to underlying cardiovascular disease. Mean arrest time was 6 minutes (range 0-30) with 39% having an arrest time > 5 minutes. Mean duration of CPR was 19 minutes (range 0-79) with 28% > 20 minutes.

**Results: Outcome.** 85% of patients survived their first post-resuscitation day. However, survival fell to only 50% by the end of the first week. By 1 month, 33 were alive and at 3 months 29%. Of the 71 deaths which occurred by 3 months, 38% were caused by cerebral failure and 42% by cardiac causes.

At the first outcome evaluation point (48-72 hours) most patients were either still in coma (45%) or already dead (21%). By 10 days, 31% had awakened (CPC 1-3), 15% remained comatose (CPC 4) and 50% had died (CPC 5). (4% no follow-up yet). At 3 months, 19% were awake, 2% were still in coma and 71% had died (7% no follow-up yet).

Because patients may awaken and achieve meaningful cerebral recovery, but then go on to die of other organ system failures, the best CPC achieved at any time was examined. This analysis showed that 43% awakened at some time during the follow-up (CPC 1-3). 36% achieved a good recovery (CPC 1,2); 25% re-

gained their previous level of cerebral function. 56% of these CPR survivors never awakened. However, by 3 months, only 2 were still in the persistent vegetative state (CPC 4).

Neurologic outcome was also related to duration of arrest. Overall mortality was the same for patients whose arrest times were  $\leq 5$  minutes and  $> 5$  minutes. However, there was a significant difference in neurologic outcome when these two groups were compared: 50% of those patients whose arrest times  $\leq 5$  minutes achieved good cerebral recovery (CPC 1-2) whereas 15% of those with arrest times  $> 5$  minutes achieved this level of neurologic function ( $p < 0.01$ ). This proportion of those patients who never awakened was the same for both groups.

**Discussion.** Patients entered into the study were still comatose at 10-15 min following resuscitation. This eliminated those who would be expected to awaken quickly. The outcome data of this standard treatment group compare favorably with other studies of post-resuscitation survivors (3). Particularly, over 5 min arrests had a 15% cerebral recovery rate. It is reassuring that only 2% of patients remain with CPC 3 at 3 months. Although such patients are awake, they are severely compromised and generally require institutionalization. Furthermore, only 2% of patients remained with CPC 4 at 3 months. These findings allay fears that improved post-CPR life support may result in increased numbers of severely brain damaged survivors.

**Conclusion.** The data obtained from analysis of the first 100 standard therapy patients of a randomized brain resuscitation study defined the natural course of neurologic outcome and mortality in severely brain insulted cardiac arrest survivors. Arrest times  $> 5$  min can be survived with recovery of human mentation. The results give hope for the development of future therapies which will be useful for producing good cerebral outcome in patients with prolonged cardiac arrests.

Supported by NIH grant NS15295.

#### References.

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