

WORKSHEET for Evidence-Based Review of Science for Emergency Cardiac Care**Worksheet author(s)**

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 1st submission: 10/30/08. Revised 3/24/09. Re-revised 4/24/09, Re-revised 9/11/09.

Clinical question.

"In adult patients with ROSC after cardiac arrest (prehospital or in-hospital) (P), does the use of seizure prophylaxis or effective seizure control (I) as opposed to standard care (no prophylaxis or ineffective seizure control)(C), improve outcome (O) (eg. survival)?"

Is this question addressing an intervention/therapy, prognosis or diagnosis? Yes, an intervention affecting outcome.

State if this is a proposed new topic or revision of existing worksheet: Revision and update of an existing worksheet.

Conflict of interest specific to this question

Do any of the authors listed above have conflict of interest disclosures relevant to this worksheet? No

Search strategy (including electronic databases searched).

Proposed Search Strategy:

- * Conduct a preliminary all encompassing search:

Electronic Data Bases Searched:

- Medline / Pubmed
- Cochrane
- Ovid

I. Pub Med search on 9/30/09

#1 "Heart Arrest"[Mesh] 25570 hits

#2 "Heart Arrest"[Mesh]OR "Cardiopulmonary Resuscitation"[Mesh] hits 29631

#3 "Heart Arrest"[Mesh] OR "Cardiopulmonary Resuscitation"[Mesh] AND ("seizures"[MeSH Terms] OR "seizures"[All Fields] OR "seizure"[All Fields]) hits 432

II. Ovid Medline (R) 1950 to Present with Daily Update search results to be reported:

	Results
1. heart arrest.mp. or exp Heart Arrest/	33701
2. cardiopulmonary resuscitation.mp. or exp Cardiopulmonary Resuscitation/	12276
3. seizure.mp or exp Seizures/	56125
4. 1 or 2	40395
5. 4 and 3	364

• State inclusion and exclusion criteria

Search Limited By: Human Studies, No Animal Studies, Peer-Reviewed Manuscript, Review Articles, After 1966, English, Book Chapter (Guidelines 2008 for C.P.R. and E.C.C.)

• Number of articles/sources meeting criteria for further review: 739 articles / abstracts were reviewed for relevance; 23 were reviewed in depth and were used to formulate this worksheet. Review of the literature included review articles and text book references. All: Non peer reviewed articles, opinions and commentaries, articles that did not directly answer the questions were excluded.

Summary of evidence

Evidence Supporting Clinical Question

Good					
Fair			Busch, 2006, 1277 Rundgren, 2006, 836	Snyder, 1980, 1292	Safar, 1984, 856 Wright, 2006, 396
Poor				Sunde, 2006, 29	
	1	2	3	4	5
Level of evidence					

A = Return of spontaneous circulation

B = Survival of event

C = Survival to hospital discharge

D = Intact neurological survival

E = Other endpoint

Italics = Animal studies

Evidence Neutral to Clinical question

Good	BRCT, I, 1986, 397 Longstreth, 2002, 506		Sunde, 2007, 29 Bernard, 2002, 557 Holzer, 2002, 549	Stecker, 2006, 1161	
Fair				McCall, 1996, 199 Rugg-Gunn, 2004, 2212 Sakabe, 1987, 256 Rocamora, 2003, 179 So, 2000, 1494 Zijilmans, 2002, 847 Howan Leung, 2007, 77 Carvalho, 2004, 595 Mascia, 2005, 340	Wijdicks, 1994, 239 Leung, 2006, 19
Poor					
	1	2	3	4	5
Level of evidence					

A = Return of spontaneous circulation
B = Survival of event

C = Survival to hospital discharge
D = Intact neurological survival

E = Other endpoint
Italics = Animal studies

Evidence Opposing Clinical Question

Good					
Fair					
Poor					
	1	2	3	4	5
Level of evidence					

A = Return of spontaneous circulation
B = Survival of event

C = Survival to hospital discharge
D = Intact neurological survival

E = Other endpoint
Italics = Animal studies

REVIEWER'S FINAL COMMENTS AND ASSESSMENT OF BENEFIT / RISK:

- A. Prophylactic use of drugs to prevent seizures after R.O.S.C. is not recommended.
 B. Hypothermia after R.O.S.C. may be neuro protective, and decrease incidence of seizures.
 C. E.E.G. monitoring for comatose patients after R.O.S.C. may be used to detect seizure activity that is not evident clinically.

One level 5 study, directly addresses the use of Anti-Seizure Medicines after cardiac arrest in adults. None of the drugs studied improved neurological outcome after R.O.S.C. (Longstreth, 2002, 506).

There is a preponderance of evidence that seizures can precipitate cardiac arrest ((i.e., Asystole, VT & VF) (McCall, 1996, 199; Rocamora, 2003, 179; Safar, 1984, 856, Sakabe, 1987, 256; Snyder, 1980, 1292; Zijilmans, 2002, 847; Howan Leung, 2007, 77; Leung, 2006, 19; Stecker, 2006, 1161; Mascia, 2005, 340; Rugg-Gunn, 2004, 2212; Carvalho, 2004, 595)) and Respiratory Arrest (So, 2000, 1494).

There is no evidence that use of prophylactic anti-seizure drugs, affects Neurological outcome, after R.O.S.C. (Longstreth, 2002, 506; BRCT, I, 1986, 397)

The prompt and aggressive treatment of post cardiac arrest seizures is of questionable efficacy. The initiation of maintenance therapy after the first event, may be instituted after ruling out potential precipitating causes (e.g. Intracranial Hemorrhage, Electrolyte Imbalance etc...) is recommended in a review article (Wright, 2006, 396).

There is some evidence that post cardiac arrest return of spontaneous circulation followed by induced hypothermia may reduce seizures (Busch, 2006, 1277); two studies showed no difference between Hypothermia treated and controles vis-à-vis seizures. (Sunde, 2007, 29; Holzer 2002, 549).

Busch Et.Al 2006 Table2

ICU complications in comatose survivors of out-of-hospital cardiac arrest (OHCA) before and after implementation of therapeutic hypothermia (TH) (n = 61). Eight Patients in the "Before TH" group were excluded from the complication assessment due to insufficient documentation.

Complications	Before TH (n=26)	After TH (n=27)	P-value
** <u>Seizures</u>	8 (30)%	0*	0.01
Pneumonia	14 (51%)	19 (70%)	0.21
Hypokalemia (K<3, 5 mmol/l)	9 (33%)	22 (81%)	0.001
Arrhythmia	9 (33%)	7 (26%)	0.37
Insulin resistance	0	5 (19%)	0.025
Elevated amylase (> 150 U/I)	14 (51%)	16 (59%)	0.40
Thrombocytopenia (< 100.00 cu/mm)	1 (4%)	0	0.74
Platelet reduction > 30%	1 (4%)	3 (11%)	0.63
Leukopenia (< 2000 cu/mm)	1 (4%)	0	0.74

Evidence points to the use of E.E.G. to detect seizure activity; even when seizures are not detected clinically (Rundgren, 2006, 836).

KNOWLEDGE GAPS:

- A. More pharmalogical agents (neuroprotective or anti-seizure medications) should be studied to determine whether treating abnormal E.E.G. patterns or seizures in patients with R.O.S.C., would prevent seizures and/or improve neurological outcome after cardiac arrest.
 B. Prospective studies that focus on the effect of hypothermia on seizures should be conducted.
 C. Studies should be conducted to determine which specific E.E.G. patterns are predictive of poor or good neurological outcome after R.O.S.C.

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Citation List

Citation Marker	Full Citation*
(Bernard, 2002, 557)	<p>Stephen A. Bernard, (2002). "Treatment of comatose survivors of out-of-hospital cardiac arrest with induced hypothermia" (N Engl J Med 2002;346:557-63.)</p> <p>Neutral L.O.E.= 3 Good.</p>
[BRCT, I, 1986, 397]	<p>BRCT, I, 1986. Randomized Clinical Study of Thiopental loading in comatose survivors of cardiac arrest. (N Engl J Med 1986; 314:397-403)</p> <p>Neutral L.O.E. = 1 Good</p>
[Busch, 2006, 1277]	<p>Busch, M., E. Soreide et al. (2006). "Rapid implementation of therapeutic hypothermia in comatose out-of-hospital cardiac arrest survivors." <u>Acta anaesthesiologica Scandinavica</u> 50(10): 1277-83.</p> <p>Supporting L.O.E.= 3 Fair.</p>
[Carvalho, 2004, 595]	<p>Carvalho, K. S., V. Salanova et al. (2004). "Cardiac asystole during a temporal lobe seizure." <u>Seizure</u>. 13(8): 595-9.</p> <p>Neutral L.O.E.= 4 Fair.</p>
[Howan Leung, 2007, 77]	<p>Leung H., K. Schindler, et al. (2007) "Asystole induced by electrical stimulation of the left cingulate gyrus." <u>Epileptic disorders</u> 9(1):77-81.</p> <p>Neutral L.O.E.= 4 Fair.</p>
(Holzer, 2002, 549)	<p>Michael Holzer, (2002) "MILD THERAPEUTIC HYPOTHERMIA TO IMPROVE THE NEUROLOGIC OUTCOME AFTER CARDIAC ARREST" (N Engl J Med 2002;346:549-56.)</p> <p>Neutral L.O.E.= 3 Good.</p>
[Leung, 2006, 19]	<p>Leung H., P. Kwan P, et al. (2006). "Finding the missing link between ictal bradyarrhythmia, ictal asystole, and sudden unexpected death in epilepsy." <u>Epilepsy & behavior</u> 9(1): 19-30.</p> <p>Neutral L.O.E.= 4 Fair.</p>
(Longstreth, 2002, 506)	<p>W.T. Longstreth, Jr., MD, MPH, (2002) "Randomized clinical trial of magnesium, diazepam, or both after out-of-hospital cardiac arrest" <u>NEUROLOGY</u> 59:506-514</p> <p>Neutral L.O.E.= 1 Good.</p>
[Mascia, 2005, 340]	<p>Mascia A., P. P. Quarato, et al. (2005). "Cardiac asystole during right frontal lobe seizures: a case report." <u>Neurological Sciences</u> 26(5):340-3.</p> <p>Neutral L.O.E.= 4 Fair.</p>
[McCall, 1996, 199]	<p>McCall, W. V. (1996). Asystole in electroconvulsive therapy: Report of four cases. <u>Journal of clinical psychiatry</u>. 57: 199-203.</p> <p>Neutral L.O.E.= 5 Fair.</p>

(Neumar, 2008, 350)	<p>Robert W. Neumar, (2008). Resuscitation 2008 Dec; 79(3): 350-79.</p> <p>Post-Cardiac Arrest Syndrome Epidemiology, Pathophysiology, Treatment, and Prognostication A Consensus Statement From the International Liaison Committee on Resuscitation (American Heart Association, Australian and New Zealand Council on Resuscitation, European Resuscitation Council, Heart and Stroke Foundation of Canada, InterAmerican Heart Foundation, Resuscitation Council of Asia, and the Resuscitation Council of Southern Africa); the American Heart Association Emergency Cardiovascular Care Committee; the Council on Cardiovascular Surgery and Anesthesia; the Council on Cardiopulmonary, Perioperative, and Critical Care; the Council on Clinical Cardiology; and the Stroke Council <i>Endorsed by the American College of Emergency Physicians, Society for Academic Emergency Medicine, Society of Critical Care Medicine, and Neurocritical Care Society</i></p> <p>Robert W. Neumar, MD, PhD, Co-Chair; Jerry P. Nolan, FRCA, FCEM, Co-Chair; Christophe Adrie, MD, PhD; Mayuki Aibiki, MD, PhD; Robert A. Berg, MD, FAHA; Bernd W. Böttiger, MD, DEAA; Clifton Callaway, MD, PhD; Robert S.B. Clark, MD; Romergryko G. Geocadin, MD; Edward C. Jauch, MD, MS; Karl B. Kern, MD; Ivan Laurent, MD; W.T. Longstreth, Jr, MD, MPH; Raina M. Merchant, MD; Peter Morley, MBBS, FRACP, FANZCA, FJFICM; Laurie J. Morrison, MD, MSc; Vinay Nadkarni, MD, FAHA; Mary Ann Peberdy, MD, FAHA; Emanuel P. Rivers, MD, MPH; Antonio Rodriguez-Nunez, MD, PhD; Frank W. Sellke, MD; Christian Spaulding, MD; Kjetil Sunde, MD, PhD; Terry Vanden Hoek, MD</p> <p>Neutral L.O.E.= 5 Good.</p>
[Rocamora, 2003, 179]	<p>Rocamora, R., M. Kurthen, et al. (2003). Cardiac asystole in epilepsy: clinical and neurophysiologic features. <u>Epilepsia</u>. 44: 179-185.</p> <p>Neutral <u>L.O.E.= 4</u> Fair.</p>
[Rundgren, 2006, 836]	<p>Rundgren M., I. Rosén, et al. (2006). "Amplitude-integrated EEG (aEEG) predicts outcome after cardiac arrest and induced hypothermia." <u>Intensive Care Medicine</u> 32(6): 836-42.</p> <p>Supporting L.O.E.= 3 Fair.</p>
[Rugg-Gunn, 2004, 2212]	<p>Rugg-Gunn F.J., R. J. Simister, et al. (2004). "Cardiac arrhythmias in focal epilepsy: a prospective long-term study." <u>Lancet</u> 364(9452): 2212-9.</p> <p>Neutral L.O.E.= 4 Fair.</p>
[Safar, 1984, 856]	<p>Safar, P. (1984). "Recent advantages in cardiopulmonary-cerebral resuscitation: A review." <u>Annals of Emergency Medicine</u> 13(9 II): 856-862.</p> <p>Supporting <u>L.O.E. =5</u> Fair.</p>
[Sakabe, 1987, 256]	<p>Sakabe, T., A. Tateishi, et al. (1987). Intracranial pressure following cardiopulmonary resuscitation. <u>Intensive care medicine</u>. 13: 256-259.</p> <p>Neutral <u>L.O.E.= 5</u> Fair.</p>
[Snyder, 1980, 1292]	<p>Snyder, B. D., W. A. Hauser, et al. (1980). "Neurologic prognosis after cardiopulmonary arrest, III: seizure activity." <u>Neurology</u> 30(12): 1292-1297.</p> <p>Supporting <u>L.O.E.= 4</u> Fair.</p>

[So, 2000, 1494]	<p>So, E. L., M. C. Sam, et al. (2000). Postictal central apnea as a cause of SUDEP: evidence from near-SUDEP incident. <u>Epilepsia</u>. 41: 1494-1497.</p> <p>Neutral <u>L.O.E.= 5</u> Fair.</p>
[Stecker, 2006, 1161]	<p>Stecker E.C., C. Vickers, et al. (2006). "Population-based analysis of sudden cardiac death with and without left ventricular systolic dysfunction: two-year findings from the Oregon Sudden Unexpected Death Study." <u>Journal of the American College of Cardiology</u> 47(6): 1161-6.</p> <p>Neutral L.O.E.= 4 Good.</p>
[Sunde, 2006, 29]	<p>Sunde K., O. Dunlop, et al. (2006). "Determination of prognosis after cardiac arrest may be more difficult after introduction of therapeutic hypothermia." <u>Resuscitation</u> 69(1): 29-32.</p> <p>Supporting L.O.E.= 4 Poor (case report)</p>
[Sunde, 2007, 29]	<p>Sunde K., M. Pytte, et al. (2007). "Implementation of a standardized treatment protocol for post resuscitation care after out-of-hospital cardiac arrest." <u>Resuscitation</u> 73(1): 29-39.</p> <p>Neutral L.O.E.= 3 Good.</p>
(Wijdicks, 1994, 239)	<p><u>Wijdicks EE</u>. Prognostic value of myoclonus status in comatose survivors of cardiac arrest. <u>Ann Neurol</u>. 1994; 35:239-243</p> <p><u>Parisi JE, Sharbrough FW</u>.</p> <p>Department of Neurology (Neurology Critical Care Service), Mayo Clinic, Rochester, MN 55905.</p> <p>Neutral L.O.E.= 5 Fair.</p>
[Wright, 2006, 396]	<p>Wright W.L. and R. G. Geocadin (2006). "Postresuscitative intensive care: neuroprotective strategies after cardiac arrest." <u>Seminars in Neurology</u> 26(4):396-402.</p> <p>Supporting L.O.E.= 5 Fair.</p>
[Zijlmans, 2002, 847]	<p>Zijlmans, M., D. Flanagan, et al. (2002). Heart rate changes and ECG abnormalities during epileptic seizures: prevalence and definition of an objective clinical sign. <u>Epilepsia</u>. 43: 847-854.</p> <p>Neutral <u>L.O.E.= 4</u> Fair.</p>