**Table 1. Observational Studies:**

CPRIC = CPR induced consciousness, NDE = near death experience

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Reference**  | **Evidence of consciousness**  | **CPR type**  | **Sedation** | **Survival**  |
| 1. Bernier 19628
 | Rescuer reported  | Manual | None  | Survival at 1 year  |
| 1. Miller 19629
 | Rescuer reported  | Internal heart massage  | Pre-med induction  | Died  |
| 1. Lewinter 1988
 | Rescuer reported  | Mechanical | IV morphine and diazepam  | Died  |
| 1. Quinn 1993
 | Rescuer reported  | Mechanical | Midazolam and succinylcholine | Died  |
| 1. Mcdonald 2005
 | Both rescuer reported and recall  | Manual | not documented  | survived to discharge  |
| 1. Yu 2006
 | Rescuer reported  | Manual | not documented  | survived to discharge  |
| 1. Bihari 2008
 | Rescuer reported  | Manual | Physical restraint  | Died  |
| 1. Tobin 2009
 | Rescuer reported  | Manual | None  | Died  |
| 1. Frederic 2011
 | Rescuer reported  | Mechanical | Sedation used in one, not documented in the other  | Died  |
| 1. Fauber 2011
 | Rescuer reported  | Mechanical | not documented  | survived to discharge  |
| 1. Ulrichs 2014
 | Patient recall | Manual | not documented  | survived to discharge  |
| 1. Greb and Heightman 2014
 | Rescuer reported  | Manual | not documented  | survived to discharge  |
| 1. Gwinnutt 2015
 | Patient recall | Precordial thump | not documented  | Survival at a couple of days post arrest  |
| 1. Hoppenfeld 2015
 | Both rescuer reported and recall  | Manual | not documented  | Both survived post arrest phase  |
| 1. Oksar 2016
 | Rescuer reported  | Manual | None  | Extubated day 1  |
| 1. Pound 2016
 | Rescuer reported  | Manual | Midazolam 2mg  | survived to discharge  |
| 1. Rice 2016
 | Both rescuer reported and recall  | Not documented  | Ketamine 2mg/kg | survived to discharge  |
| 1. Grandi 2017
 | Rescuer reported  | 5 manual, 1 mechanical | Mix of physical restraint, fentanyl, propofol and rocuronium  | 2 died, 4 survived to discharge  |
| 1. Gray 2018
 | Both rescuer reported and recall  | Manual | 4-point restraint  | Survival to 3 months |
| 1. Wacht 2018
 | Rescuer reported  | Manual then mechanical  | Considered, not used  | survived to discharge  |
| 1. Pinto 2019
 | Rescuer reported  | Manual | None  | Died  |
| 1. Sukumar 2019
 | Both rescuer reported and recall  | Manual | None  | survived to discharge  |
| 1. Ashgar 2020
 | Rescuer reported  | Manual | None  | Died  |
| 1. Chin 2020
 | Rescuer reported  | Manual | not documented  | survived to discharge  |

**Table 2. Case Studies:**

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**Table 3. Review Studies:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Reference**  | **Design type** | **Question**  | **Included**  | **Rescuer reports**  | **CPR type** | **sedation** | **Survival**  |
| 1. Olaussen 2014
 | Systematic review  | Identify cases of CPR induced consciousness,and management strategies. | 9 cases of 10 patients | Purposeful arm movements, eye opening, localising, verbal, and nonverbal communication, complying with instructions.  | 6 out of the 9 cases mechanical CPR | For 3 cases sedation status was not recorded, 1 no sedation, 2 physical restraint / reassurance, 2 used sedation nonspecific, 1 small doses of morphine and diazepam, 1 midazolam and succinylcholine  | 4 out of 10 survived, 1 patient recalling events.  |
| 1. Lunsguaard 2019
 | Shortcut review  | In patients who show signs of awarenessduring CPR are pain management and/orsedation indicated to improve patients’outcome | 3 case reports (n=8), 1 letter to editor (no. not stated), 1 retrospective Cohort (n=117 patients) 1 Prospective study (no. not stated), 1 systematic review (n=10)  | Limb movements, eye opening, finger gestures, localising  | NA  | Out of the 7 articles sedation outcome recorded in 5. 1 used midazolam + morphine a second midazolam only, 1 using ketamine, 1 propofol and fentanyl, 1 a combination of opioids, midazolam, and muscle relaxants  | Not Recorded |
| 1. Pourmand 2019
 | Existing literature review  | Literature search for unifying themes on CPR induced consciousness  | 1 retrospective study (n=112) and 9 case studies (n=10)Total patients 122 | Purposeful movements, communicating and eye opening  | 45% of retrospective study used mechanical CPR, 3 of the case studies mechanical, 5 manual  | Sedation used in 3 out of the 9 case studies and in 49.5% of cases in the retrospective study. Mix of midazolam and ketamine used  | 3 out of the 10 patients in the case studies reported patient deceased. 3 Case studies reported total recall  |

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**Figure 1. Sedation Regimens:**

* 1) Rice Nebraska Protocol
	+ If Signs of consciousness give:
		- Ketamine bolus IV 0.5-1.0 mg/Kg, IM 2-3 mg/Kg
		- Consider Midazolam bolus 1 mg IV, 2 mg IM
		- Can repeat ketamine bolus every 5-10 min or infusion 2-7 mcg/Kg/min
* 2) Dutch Ambulance service
	+ When giving mechanical chest compressions
		- Fentanyl 2 mcg/Kg or Midazolam 2.5 mg
* 3) Wellington Free Ambulance service
	+ If movement significant enough to interfere to resuscitation:
		- Ketamine IV 1 mg/Kg
		- If continuing significant movement rocuronium (if ETT in place)
* 4) Victoria, Australia ambulance protocol
	+ If patient interferes with CPR, has present gag reflex, or appears to be aware:
		- Fentanyl 25 mcg IV, repeat every 3-5 min
		- If critical care trained Ketamine 20mg IV/IO, repeat every 3-5 min

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