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# Resuscitation

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## Letter to the Editor

### CPR induced consciousness: It's time for sedation protocols for this growing population

Q3 Sir,

In 2015, the Leona Helmsley Foundation granted the State of Nebraska close to 6 million dollars for the deployment and training of the LUCAS® 2 Chest Compression System.<sup>1</sup> After deployment, reports of patients regaining consciousness during CPR began to surface. The state EMS office evaluated whether there was a potential gap in care and whether sedation policies were needed.

In 2015, paramedics in Nebraska responded to a 55-year-old male with a history of coronary artery disease and stent placement. A prehospital 12-lead ECG showed evidence of an inferior myocardial infarction with ST elevation in leads II, III, and AVF. The patient soon deteriorated into ventricular fibrillation (V-fib). After approximately 20 s of CPR and a single defibrillation the patient had return of spontaneous circulation (ROSC).

After arriving in the emergency department, his V-fib reoccurred. The patient remained awake, alert, able to speak, and engaged in purposeful movements during chest compressions. The ED staff was able to communicate to the patient including warning him when they were going to defibrillate. He was sedated with 2 mg/kg of ketamine for continued consciousness and was successfully intubated. After 23 min of resuscitation efforts, he attained sustained ROSC. Angiography revealed a 100% occlusion of the proximal right coronary artery.

The patient was interviewed prior to discharge. He was able to clearly recall the events in the ED up until the time of ketamine administration. After his ketamine bolus, he then described a

floating sensation while looking into the faces of the staff. The patient had a complete recovery without any neurological deficits and was discharged home.

Parnia et al. conducted a multi-year, multi-center, prospective study of the frequency of awareness during resuscitation by interviewing cardiac arrest survivors after discharge. They found 55/140 (39%) had perceptions of awareness of being alive and even memories that originated during that time.<sup>2</sup>

A growing body of evidence has identified some patients receiving CPR regaining consciousness while not having a spontaneous heartbeat. A patient making purposeful movements, even being awake and alert while in cardiac arrest, can have profound emotional and psychological implications on the patient as well as the paramedic providers caring for them.<sup>3</sup>

An unintended consequence of improving resuscitation techniques may be that we are subjecting 'aware' patients to psychological trauma and the physical pain of CPR with increasing frequency. Of additional concern is the physiological response to these factors and their impact on critically ill patients in the pre-, peri-, and post-arrest phases.<sup>4</sup>

As more advanced paramedic services adopt clinically proven resuscitation practices such as high quality CPR, our concern, is there will be a growing number of patients who become aware of their own cardiac arrest event. This necessitates further research, education and training of prehospital care providers in the management of patients experiencing CPR induced consciousness. Like the Dutch,<sup>5</sup> until there is more research, we have chosen to treat the pain associated with CPR induced consciousness (see [Table 1](#) – Nebraska Model Protocols).

Table 1

Nebraska EMS Model Protocols  
Adult Medical Protocols  
CPR Induced Consciousness Sedation Protocol

**ALL LEVELS**

- ALS or BLS protocols for CPR
- Assess for signs of consciousness: Spontaneous eye opening, purposeful movement, verbal response to include moaning

**First Responders, Primary Care Paramedics, Intermediate Care Paramedics\***

- Continue CPR
- If tiering is available, request ALS intercept

**Advanced Care Paramedics\***

- Administer Ketamine Bolus  
IV: 0.5-1.0 mg/kg  
IM: 2-3 mg/kg
- Consider coadministration of midazolam bolus  
IV: 1mg  
IM: 2mg
- May repeat Ketamine bolus after 5-10 minutes if needed for continued sedation or if needed for continued sedation start infusion
  - IV bolus dose: 0.5-1.0 mg/kg OR IM: 2-3 mg/kg
  - IV infusion dose: 2-7 mcg/kg/minute

\*Training Classifications have been adapted to international classifications

57 **Q4** Conflict of interest statement

58 None declared.

59 **References**

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61 Control. None of the authors were involved in the production of, and do not  
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