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Title: Code Chill - Processes Improvement: Targeted Temperature Management (TTM) to Treat Post-Cardiac Arrest

Background:

The incidence of out of hospital cardiac arrest (OHCA) is reported between 35.7 to 128.3 per 100,000 cases per year. Even with advancements in life support, the survival rate for OHCA is very poor. Approximately Only one out of 10 patients with OHCA survive to hospital discharge. Inducing mild therapeutic hypothermia in select subset OHCA patients, improves the chance of survival and neurological outcome. A 2011 meta analysis of randomized controlled trials showed the benefits of therapeutic hypothermia. The 2015 AHA guidelines update: All comatose (ie, lacking meaningful response to verbal commands) adult patients with Return of Spontaneous Circulation (ROSC) after cardiac arrest should have TTM, with a target temperature between 32°C and 36°C selected and achieved, then maintained constantly for at least 24 hours. Routine pre-hospital cooling is labeled class III (moderate to no benefit). But timely initiation of cooling is critical. It is recommended to aim for cooling to start as soon as possible but less than 6 hours from the time of arrest and achieve the target temperature as quickly as possible. In most situations, it is possible to achieve the target temperature within 3-4 hours of initial cooling. Cooling is recommended for at least 24 hours followed by slow re warming. Initiating TTM program requires integration of multiple service lines within the hospital. So education and coordination is critical. All the necessary departments and participants must be educated and their roles made clear. The study is a retrospective chart review of patients who underwent TTM in a 225 bed community hospital in mid west. The aim of the study is to asses the impact of a structured "Code Chills" program on the achievement of set target parameters. The target parameters were: Time to initiate cooling after ROSC: Less than 6 hours; After initiation, time to reach Target Temperature:3-4 hours; target temperature:32-34 degree Celsius; Duration of Induced Hypothermia: 24 hours; Re warming: No faster than 0.5 Degree Celsius per hour.

Methods:

This is single center experience in a 225 bed community hospital in mid west with an interventional cardiology with 24/7 Interventional cardiology and cardiac Surgery program and a trauma center. A multidisciplinary team reviewed the literature and the current guidelines regarding TTM and developed a "Code Chill" protocol. Inclusion and exclusion criteria, Initiation and maintenance of hypothermia, ventilation, shivering management, blood glucose management, electrolyte management, nutrition, were included in the guideline. All the necessary departments and participants were educated and their roles made clear. As soon as any patient who the inclusion criteria for TTM is encountered, "Code Chill" was activated by the ER provider. The "Code Chill" call was announced by overhead as well as electronic paging system. Cardiology and Neurology were including in the group page. The attending medical staff responsible for the TTM program on call was responsible for following the institutional TTM guidelines and managing patient. The TTM order sets and flow sheets were embedded in Electronic Medical records (EMR).

Results:

Chart review was performed on 9 patients who underwent TTM at this community hospital. The mean time between code chill call and cooling initiation was 4 hour and 9 minutes (SD 81 minutes). Mean time to reach target temperature was 4 hour and 9 minutes (SD 96 minutes). The mean temperature achieved was 32 Degrees Celsius (SD 0.55). The mean duration of cooling was 25h and 38 minutes (SD 115 minutes). The Mean duration of re warming was 15 hours and 50 minutes (SD 59 minutes). Average re warming rate was 0.33 degree Celsius per hour.

Conclusion:

The results indicate that, a structured "Code Chills" program had a positive impact on the achievement of set target parameters. All of the following target parameters were achieved: Time to initiate cooling after ROSC: Less than 6 hours; After initiation, time to reach Target Temperature: 3-4 hours; Target Temperature: 32-34 degree Celsius; Duration of Induced Hypothermia: 24 hours; Re warming: No faster than 0.5 Degree Celsius per hour. We attribute this to the education and coordination of all the necessary departments and participants. Clearly defining the roles of each "Code Chill" team member was also critical.