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Robert Tomsho DO, MS
Lehigh Valley Health Network, Robert_J.Tomsho@lvhn.org

Karen Pheasant DO
Lehigh Valley Health Network

Valerie A. Rupp RN, BSN
Lehigh Valley Health Network, Valerie.Rupp@lvhn.org

Kathleen E. Kane MD
Lehigh Valley Health Network, kathleen_e.kane@lvhn.org

Bryan G. Kane MD
Lehigh Valley Health Network, bryan.kane@lvhn.org

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A Feasibility Study to Determine if Inexpensive Commercial Coolers Maintain Normal Saline Temperatures at 4° C

Robert Tomsho, DO, MS; Karen Pheasant, DO; Valerie Rupp, RN, BSN; Kathleen Kane, MD; Bryan Kane, MD
Lehigh Valley Health Network, Allentown, Pennsylvania

Study Objectives:

Induced hypothermia (IH) during the post resuscitation care of comatose survivors of cardiac arrest is recommended by the American Heart Association (AHA) and the International Liaison Committee on Resuscitation (ILCOR). However, IH is typically initiated after admission to the hospital. Preliminary animal studies by Abella et al, 2004 indicate that rapid cooling contributes to improved survivability. Limitations to pre-hospital initiation of cooling include the cost of the refrigeration units and placement in the ambulances. Bernard et al, 2003, showed that rapid cooling can be achieved by rapid infusion of 2L of 0.9% normal saline (NSS) at 4°C. This study was designed to determine if inexpensive commercially available coolers could, in conjunction with 3 reusable ice packs, keep 2 bags of NSS cool for an average EMS crew shift, or 8 to 12 hours.

Methods:

This was a non-human subject prospective, feasibility study conducted in a controlled environment with a temperature maintained between 18-21°C. Two popular commercial coolers available for approximately \$25 USD were filled with two 1L bags of pre-chilled NSS and 3 frozen reusable ice packs. Temperature was measured every 30 minutes utilizing a cardiac temperature sensing probe placed into a NSS bag. While we screened several commercially available coolers, two were tested with the experiment. Hard shell style coolers were ultimately selected; styrofoam only models were not included. One probe was placed into each cooler. Crossover of each temperature probe occurred as well. The lid was not opened during temperature measurement. The bags of NSS were pre-cooled in an ice water slurry bath prior to initiation of the experiment.

Coolers Used for Study



Saline in Cooler with Probe Inserted



Saline Bag with Temperature Probe Inserted



Saline with Probe Inserted and Ice Packs Placed in Cooler



Results:

Two trials were undertaken with each type of cooler and referred to as cooler A and cooler B. Summative results are shown below. Regression analysis of the two coolers, with a confidence level of 0.01, demonstrates a coefficient of R=.990.

Temperature of Normal Saline

Time in Hours	Cooler A Probe 1 *	Cooler A Probe 2 *	Cooler B Probe 1 *	Cooler B Probe 2 *
0	2.0	2.1	2.0	2.1
2	1.8	1.6	1.2	1.8
4	2.0	1.9	1.8	2.0
6	2.3	2.0	3.0	2.6
8	3.0	2.8	3.1	3.3
10	4.5	4.2	3.5	3.5
12	4.8	4.5	3.9	3.5

*Temperature of NSS in °Celsius. Number indicates the temperature probe utilized.

Conclusions:

This preliminary work indicates that small, inexpensive, commercially available coolers in conjunction with three frozen, reusable ice packs can keep the volume of pre-chilled saline (2L) necessary to rapidly cool most subjects at an appropriate temperature in a controlled environment for the length of most EMS crew shifts. Based on regression analysis, the choice of which cooler to use may not be significant.

Regression Analysis

