Cool enough to induce hypothermia?

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Introduction
Mild induced hypothermia after cardiac arrest seems to increase the likelihood of neurologically intact survival. Induction of hypothermia by infusion of cold fluid is simple, cheap, does not require special equipment and can be performed in a pre-hospital environment, emergency department or an ICU setting. Infusing temperature higher than 4°C could increase the volume of fluid needed, prolong the induction phase and/or contribute to development of complications.

Effect of flow rate and heat insulation of intravenous tubing on the temp. of the fluid at level of the cannula (when infusing cold saline).

Aims
Rate of warming of 0.5 L bags of saline wrapped in ice packs and without ice packs.

Methods
• Measurements performed at ambient temp. 23°C-
• Mean initial temp. in the bags was 3.96 ± 0.17°C.

Results

Figure 1. The difference between temperature in the bags and in the bag at infusion rates 10, 30, 60 and 100 ml/min, measured with iv. tubing wrapped in aluminum foil.

Mean rates of warming:
- bags wrapped in ice packs 3.4°C/h
- bags without ice packs 6.9°C/h

With non-insulated tubing, we observed significantly higher temperatures in the cannula compared to temperatures in the bag at all flow rates (all p <0.0001). Temperature gain with insulated tubing was lower compared to non-insulated and reached statistical significance at all flow rates (all p<0.0001).

Temperature gain from the bag to cannula was statistically significantly lower for insulated tubing at all flow rates.

For insulated as well as for non-insulated tubing, the rise in temperature was significantly lower at higher flow rates.

The temperature of fluid in bags not wrapped in ice packs was significantly higher than in bags wrapped in ice packs at every time point from 5 minutes on.

Conclusions
When inducing mild hypothermia at ambient temperature 23°C we suggest using high flow rates (at least 100 ml/min) and heat insulated intravenous tubing to avoid excessive fluid temperature gain. Bags of cold fluid should be taken from the refrigerator just before starting the infusion and kept wrapped in ice packs to prevent warming.