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Letter to the Editor

Reply to: Revised Swiss System for clinical staging of accidental hypothermia – At which core temperatures are patients at high risk of cardiac arrest?

We have read the letter written by Dr. Dietrichs and Dr. Strapazzon with great interest. The suggestion of a biphasic relationship between risk of electrode-induced ventricular fibrillation (VF) and core temperature in a small number of cooled rabbit hearts (but not rats) in a laboratory setting is highly interesting.

However, we would like to point out the following issues with the proposed parallelism with human electrophysiology and clarify the use of the Revised Swiss System for the field classification of primary accidental hypothermia, when no measurements of core temperature are available.[1]

First, the Revised Swiss System is not a score and does not attempt to estimate a range of core temperature as suggested in Dr. Dietrich's letter. The main advantage of the Revised Swiss System is to move the field provider from estimating core temperature to estimate the patient's risk of cardiac arrest. We demonstrated the limitations of the original Swiss System, and acknowledge that the revised classification deserves a broad approach. Due to the continued unknowns of the natural history of the disease, we want to avoid inaccurate assumptions.

Secondly, as discussed in the reference cited by the letter authors, cardiac electrophysiology is largely species-dependent.[2] While a rabbit heart resembles human cardiac electrophysiology better than other species, it is easy to imagine significant unknown differences to make direct comparisons of the myocardium of *lagomorphs* and *homo sapiens* problematic.

Analyzing the history of accidental hypothermia electrophysiology research, we have already encountered that relevant animal findings do not completely correlate with human electrophysiology. For example, the hypothesis that J-waves correlate highly with ventricular fibrillation in humans, as demonstrated on hypothermic canines, has been inconsistently detected in human studies.[2–4]

Thirdly, the electrophysiological studies cited by Dr. Dietrichs and Dr. Strapazzon hypothesize a biphasic relationship between core temperature and myocardial irritability (VF-susceptibility). They rely on the classic hypothermia staging of mild-moderate-severe hypothermia which is based on core temperature. In contrast to this assumption, the Revised Swiss System is based on a relationship between the level of consciousness and myocardial irritability (risk of CA), *independent of the core temperature*; the main advantage of this classification.

Even if using the original system and core temperatures, the received letter suggests that during cooling towards 30 °C (i.e., stage 2), the risk of VF increases, whereas further cooling to severe hypothermia (i.e., stage 3) seems to induce resistance to VF. This was not observed in the cited study by Darocha et al. Of 206 patients with witnessed hypothermic cardiac arrest, only five of 206 (2.4%) had a body temperature >28 °C (lower limit of Stage 2 of the original Swiss Staging System). The mean body temperature at which witnessed cardiac arrest occurred, considering all rhythms, was 23.9 °C.[5]

Lastly, even in the scenario where patients are at greater risk of VF at hypothermia stage II than at stage III, VF/pVT accounts for 64% of patients presenting with subsequent cardiac arrest. While patients can present in cardiac arrest after developing VF, up to one third may develop asystole or PEA arrest without prior VF.[5]

We are delighted that the Revised Swiss System has already ignited an electrophysiologic debate based on animal studies, but we wish to emphasize the practical field use of the RSS. Focussing on the level of consciousness and risk of CA allows first responders using this system to focus on careful patient handling, efficient transport and evacuation to an appropriate health care facility.

Conflict of interest

HB receives grants, as the Head of the Institute of Mountain Emergency Medicine, from Eurac Research, Bolzano, Italy. KZ is a

paid author of the topic, Accidental Hypothermia in Adults, for UpToDate. The other authors have no conflicts of interest to disclose.

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