Epidemiology of accidental hypothermia in polytrauma patients: An analysis of 15,230 patients of the TraumaRegister DGU

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BACKGROUND: Accidental hypothermia (AH) endangers the patient after polytrauma. Past studies have emphasized this entity as a major risk factor. The aim of this study was to describe the epidemiology of AH in major trauma considering the preclinical and clinical course. Predictors should be elucidated.

METHODS: This is a retrospective investigation from the TraumaRegister DGU. Patients were documented in the period between 2002 and 2012. The study compared multiple-injured patients with or without hypothermic temperatures. Different groups of body core temperature were analyzed. Preclinical and clinical parameters were documented.

RESULTS: Fifteen thousand two hundred thirty patients could be included. In 5,078 patients, temperature was below 36.0°C. Blunt trauma mechanisms surpassed penetrative injuries. The majority of patients sustained car accidents, accidents involving pedestrians, and falls from heights of greater than 3 m. Preclinical rescue procedures were extensively long in patients with low body temperature. Female gender, Glasgow Coma Scale score of 8 or less, nighttime, winter, motorcycle/bicycle accidents, Injury Severity Score 9 or greater, shock on site and in the emergency room, preclinical volume therapy, and time until admission to emergency room are significant risk factors to develop AH of 33°C. Volume management ranged between 1,453 ± 1,051 mL (33°C) and 1,058 ± 768 mL (36°C). Treatment in emergency room was extensively long. In further clinical course, severe AH advanced the clinical development of sepsis and multiple organ failure. The overall mortality inclined with decreasing body temperatures.

CONCLUSIONS: Accidental hypothermia regularly occurred in polytrauma patients. Certain predictors exist, that is, female gender, which facilitate a body core temperature of 33°C. Preclinical and clinical courses match with other polytrauma studies. High incidence rates of sepsis, multiple organ failure, and mortality in hypothermic patients (33°C) demonstrate the severity of injury. Unfortunately, documentation of body core temperature remains challenging as the number of recorded hypothermic patients appears to be too small. We favor a strict focus on body core temperature on arrival in the emergency room. (J Trauma Acute Care Surg. 2016; 81: 905-912. Copyright © 2016 Wolters Kluwer Health, Inc. All rights reserved.)

LEVEL OF EVIDENCE: Prognostic and epidemiological study, level III.

KEY WORDS: Accidental hypothermia; multiple organ failure; polytrauma; shock; TraumaRegister DGU (TR-DGU).

Major trauma patients are continuously endangered to suffer from accidental hypothermia (AH). The menace of AH was clarified as patients sustain a "lethal triad" subsuming the entities of hypothermia, acidosis, and coagulopathy. Moreover, the clinical course enhances complications such as sepsis and multiple organ failure and even increased mortality. Considering its genesis, AH is defined as a body core temperature lower than 35°C, and it is subdivided by degree centigrade in mild, moderate, and severe hypothermia. Accidental hypothermia is likely to emerge as trauma patients are exposed to cold environmental conditions, volume management with cold liquids, exsanguination, and narcotics. Because of major trauma, different types of injuries seem to be linked to the appearance of AH such as abdominal and pelvic injuries and extremity and vascular injuries. Most notably, patients in hypovolemic states suffer from hypothermic temperatures. Two other causes of hypothermia are feasible: endogenous hypothermia due to metabolic disorders in diabetics and malfunctions of the thyroid gland. Thermoregulatory failures of the central nervous system might induce hypothermia. Therapeutic hypothermia is widely applied in the field of cardiovascular and transplantation surgery. Furthermore, therapeutic hypothermia is utilized after cardiac arrest and return of spontaneous circulation, currently recommended by the International Liaison Committee on Resuscitation, respectively, the European Resuscitation Council and the American Heart Association. In opposition, AH in trauma is associated with several pathological pathways including cardiovascular, respiratory, and immunologic disorders. Coagulopathy due to AH has been in the extended focus. Studies reported on reduced clotting formations in temperatures below 35°C with higher rates of intraoperative bleeding than in patients with normothermia. The diminished function of thrombocytes...