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Thermoregulation in premature infants: a mathematical model

Carina Barbosa Pereira[1*], Konrad Heimann[2], Michael Czaplik[3], Vladimir Blazek[1,4], Boudewijn Venema[1], Steffen Leonhardt[1]

[1]Chair for Medical Information Technology, Helmholtz-Institute for Biomedical Engineering, RWTH Aachen University, Aachen, Germany

[2]Department of Neonatology, University Children's Hospital, University Hospital RWTH Aachen, Germany

[3]Department of Anesthesiology, University Hospital RWTH Aachen, Aachen, Germany

[4]Czech Institute of Informatics, Robotics and Cybernetics (CIIRC), CTU Prague, Prague, Czech Republic

Corresponding author. Chair for Medical Information Technology, Helmholtz-Institute for Biomedical Engineering, RWTH, Aachen University, Pauwelsstrasse 20, D-52074 Aachen, Germany, Phone: +49 241 80 – 23202. pereira@hia.rwth-aachen.de

Abstract

PURPOSE:

In 2010, approximately 14.9 million babies (11.1%) were born preterm. Because preterm infants suffer from an immature thermoregulatory system they have difficulty maintaining their core body temperature at a constant level. Therefore, it is essential to maintain their temperature at, ideally, around 37 °C. For this, mathematical models can provide detailed insight into heat transfer processes and body-environment interactions for clinical applications.

METHODS:

A new multi-node mathematical model of the thermoregulatory system of newborn infants is presented. It comprises seven compartments, one spherical and six cylindrical, which represent the head, thorax, abdomen, arms and legs, respectively. The model is customizable, i.e. it meets individual characteristics of the neonate (e.g. gestational age, postnatal age, weight and length) which play an important role in heat transfer mechanisms. The model was validated during thermal neutrality and in a transient thermal environment.

RESULTS: