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Introducing the Human-Centric Indoor Climate for Healthcare Facilities (HumanIC) project

Objectives: This paper introduces the “Human-Centric Indoor Climate for Healthcare Facilities” (HumanIC) project, granted in the EU Marie Curie Program framework. It aims to advance the understanding of the human-centric indoor climate (HCC) within hospital environments, focusing on its impact on patient safety, infection control, thermal comfort, and energy efficiency. The objective aligns with the Europe 2030 strategy to foster innovative and sustainable health systems, enhancing healthcare quality for EU citizens. The Warsaw University of Technology leads the project, including eleven doctoral research theses across eight leading European universities.

Methods: The HumanIC network adopts a multidisciplinary approach to explore the interactions between contamination sources and airflow distribution systems in hospital indoor environments. Research methods include analysing airflows and contaminant particles, optimising ventilation systems for various healthcare activities, and developing real-time interaction tools for design and operational phases. This innovative approach transcends traditional methods, focusing on building designs and ventilation systems and the complex interactions between contamination sources, airflow dynamics, and hospital clinical needs.

Results: The initial findings indicate that poor indoor climate conditions contribute significantly to healthcare-associated infections (HAIs), which affect over 4 million patients annually and approximately 80,000 cases reported daily in the EU. The study recognises that the hospital environment is responsible for 20% of HAIs and that improved indoor environments can reduce airborne illness costs by 9%-20%. By examining transient dispersion of contaminants in critical areas such as operating rooms and isolation units, new knowledge is generated to inform health facility design, addressing the dual challenges of minimising airborne threats while ensuring thermal comfort.

Conclusions: The promotion of HCC in hospitals offers a promising pathway to enhance patient outcomes and operational efficiency. The HumanIC network will continue until 2027, producing innovative design methodologies and technical solutions incorporating human interactions within hospital settings. Moreover, the initiative will foster an inclusive scientific community dedicated to advancing healthcare environmental engineering, aiming for diverse representation with a commitment to attracting and supporting underrepresented groups in science and engineering. The findings and methodologies from this research may lead to significant improvements in hospital design and operation, ultimately reducing HAIs and improving patient care.

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