

The ethics, applications, and contributions of cadaver testing in injury prevention research

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Abstract-

Objective

This study aims to establish best practices and guidelines to ensure that experimental research utilizing Postmortem Human Subjects (PMHS) for injury prevention adheres to relevant ethical principles, which are also commonly accepted in research involving human tissues and living subjects. Furthermore, it reviews existing literature to underscore the pivotal role of PMHS testing in evaluating the efficacy of safety systems, with a particular focus on airbag performance.

Methods

This paper conducts an examination of the primary ethical principles governing human subject research as outlined in the Declaration of Helsinki (1965) and traces their evolution up to the latest framework proposed by the Council for International Organizations of Medical Sciences (CIOMS) in 2002. Input was solicited from international experts and laboratories experienced in PMHS testing to understand how these ethical principles are implemented in practice. This is complemented by a comprehensive review of literature that assesses the contribution of PMHS testing to airbag performance enhancements in frontal impacts.

Results

The findings underscore the importance of informed consent from donors or their next-of-kin, as highlighted in CIOMS declarations, to ensure the ethical integrity of the donation process in line with international standards. The study also finds it customary for an independent review board to evaluate the research methodology and the necessity of employing PMHS tissue over alternative methods, such as computational models or crash test dummies. Despite various national regulations on human subject participation and living tissue research, no specific legal framework governing PMHS tissue use was identified. The systematic literature review revealed that PMHS testing has been crucial in identifying potential injury mechanisms not detected by Anthropomorphic Test Devices (ATD), significantly contributing to the enhancement of computer human body models and the biofidelity of crash test dummies.

Conclusion

The International Council on the Biomechanics of Injury (IRCOBI) recognizes

the need to provide guidance for research involving human cadaveric tissue to be conducted with the highest ethical standards. This study proposes five recommendations to ensure adherence to these ethical principles in PMHS testing, highlighting the paramount importance of obtaining informed consent and securing independent committee approval. Moreover, IRCOBI emphasizes that until a thorough understanding of tissue damage tolerance levels is achieved and human surrogates, such as ATDs or Human Body Models (HBM), reach full biofidelity, the use of human cadavers remains indispensable for developing effective injury prevention strategies and measures.

Index Terms- Ethics, Post Mortem Human Subjects, Airbags, Cadaver tests

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