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Deconstructing the "Apples and Oranges" Problem in Mechanical Circulatory Support: A Computational Approach

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Abstract

The use of mechanical circulatory support (MCS) in acute myocardial infarction-related cardiogenic shock (AMI-CS) has been a matter of contestation due to conflicting evidence. Though the trials IABP-SHOCK II and ECLS-SHOCK yielded neutral outcomes, the DanGer Shock trial in 2024 highlighted a notable mortality benefit. An inquiry into these prior analyses revealed how they had pooled heterogeneous devices and patient populations.

Combining VA-ECMO and microaxial flow pumps which have opposing physiological effects, and including high rates of cardiac arrest patients, were confounding factors which obscured device-specific haemodynamic benefits. MCS-Logic v4.1 is able to find a computational solution to these issues by presenting meta-analyses as an interactive, dynamic, criteria-based process. Toggling sensitivity filters allows users to isolate different populations, such as "DanGer-like" from "ECLS-like".

There are also measures against pooling devices with opposing physiology, and a system which automatically adjusts the certainty of a result for the heterogeneity and indirectness. Through these features, MCS-Logic v4.1 demonstrates that the prior controversy was owing to patient selection rather than device failure, and elucidates the therapeutic benefit across the trials.

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