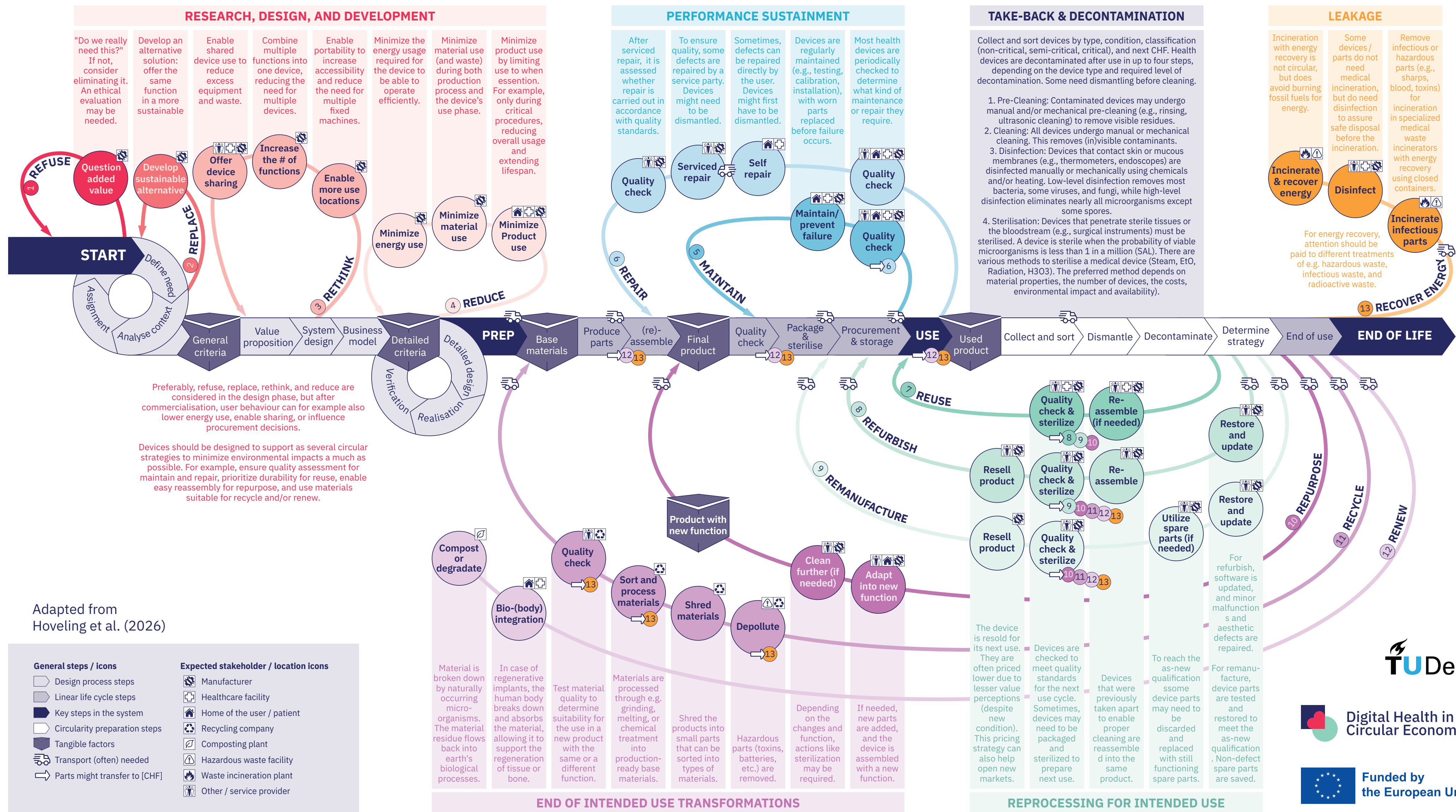


Circular Healthcare Flows



Adapted from
Hoveling et al. (2026)

TU Delft

Digital Health in the
Circular Economy

Funded by
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- 1 REFUSE**
- The intentional act of rejecting the production, consumption, or use of a medical product, material, or procedure, particularly those that are unnecessary, unsustainable, or harmful.
- 2 REPLACE**
- Substituting a medical product or procedure with an alternative that serves the same purpose but significantly reduces environmental impact.
- 3 RETHINK**
- Systemically enhancing the procedures surrounding product use to drive environmentally sustainable practices, such as through rethinking patient transport and telemedicine, sharing products or introducing multifunctionality.
- 4 REDUCE**
- Increasing efficiency in healthcare delivery and medical manufacturing by minimising energy and resource use, avoiding unnecessary production or consumption, limiting hazardous substances, and minimising (unnecessary) procedures.
- 5 MAINTAIN**
- Preserving the quality, function, and safety of medical products and clinical environments to ensure reliable performance, extend their lifespan, and reduce the risk of malfunctions that could lead to potential treatment failures.
- 6 REPAIR**
- Restoring a faulty or broken product or component to a usable state to fulfil its intended use, which typically involves corrective maintenance, ensuring that safety and performance specifications are met for an extended period of time.
- 7 REUSE**
- Repeated use of a medical device on multiple patients for the same intended purpose, after decontamination when needed, and without significant modification.
- 8 REFURBISH**
- Restoring a product to good working condition through decontamination, repairs, upgrades, cosmetic changes, performance checks, reinstallation, warranty assurance, and parts replacement.
- 9 REMANUFACTURE**
- Restoring products and components, often utilizing parts from discarded products, to achieve as-new condition through disassembly, decontamination, quality control, certification, repackaging, and redistribution.
- 10 REPURPOSE**
- Using discarded products or parts for different purposes than originally intended, such as in varied contexts (e.g. veterinary care procedures), purposes (e.g. different human procedures) and locations (e.g. developing countries).
- 11 RECYCLE**
- Transforming waste materials from used products or resources into new raw materials, either of the same or lower quality, through e.g. decontamination, shredding, and moulding.
- 12 RENEW**
- Transforming waste materials, energy sources, and other substances into basic elements like carbon dioxide, water, biomass, or human tissue (for regenerative medicine) through natural processes.
- 13 RECOVER ENERGY**
- Incineration (or medical incineration) of waste materials with energy recovery.