ERA250222

SUSTAINABILITY IN HEALTHCARE

Research at Erasmus MC

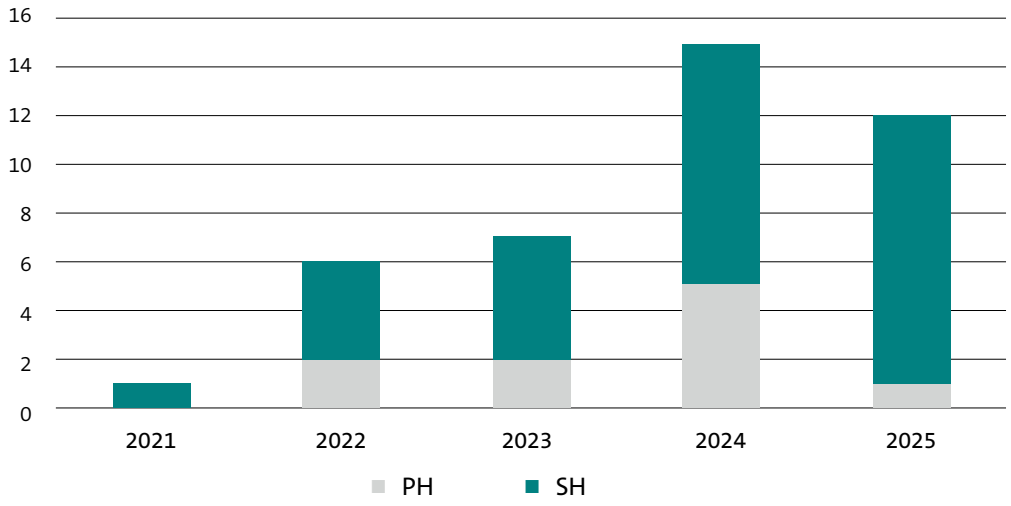
Erasmus MC
Universitair Medisch Centrum Rotterdam

Sustainability in Healthcare

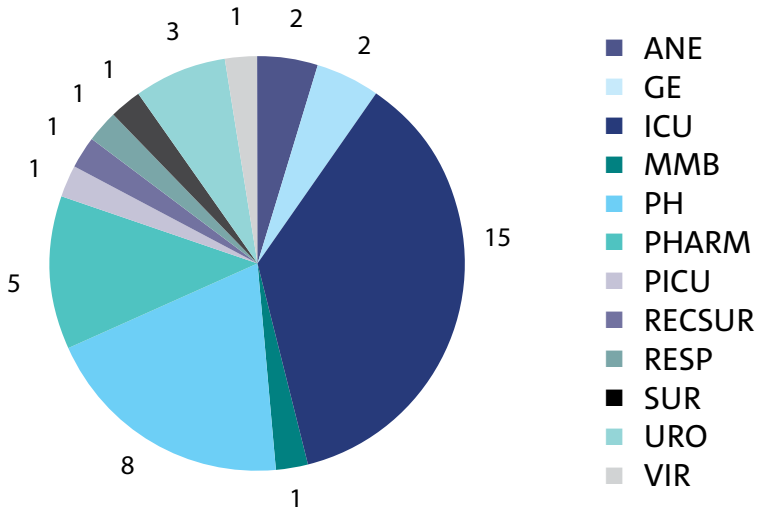
Research at Erasmus MC

This brochure presents an overview of research conducted from 2021-2025 at Erasmus MC focused on sustainability in healthcare. From reducing waste in anesthesia to making endoscopic practices more environmentally friendly, a total of 41studies are highlighted. These publications offer valuable insights and practical guidance for researchers, healthcare professionals, and policymakers who are committed to reducing the environmental footprint of healthcare and contributing to a more sustainable future.

Number of publications per year (till April 2025)



Publications per department from 2021 - 2025 (April)



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Planetary Health
Sustainable Healthcare

Overview studies

2021

Department of Reconstructive Surgery
ICOPLAST Trainees Europe: Uniting Plastic Surgery Trainees Around Training, Research and Sustainability

The article “ICOPLAST trainees Europe: Uniting plastic surgery trainees around training, research and sustainability” describes how plastic surgery trainees across Europe are coming together within ICOPLAST to collaboratively improve education, initiate international research efforts, and promote sustainability in the field.

Read more

2022

Department of Public Health
The Elephant in the Room of ‘Planetary Health’

In his editorial Johan P. Mackenbach argues that discussions on planetary health often overlook the significant impact of global population growth on environmental degradation. He discusses the public health sector for its reluctance to address population dynamics, attributing this to ethical concerns and discomfort with policies that might infringe on reproductive rights, and urges for open discussion on how demographic trends, alongside consumption, impact the planet’s sustainability.

Read more

Department of Viroscience
One Health: A new definition for A Sustainable And Healthy Future

The One Health approach emphasizes the interconnectedness of human, animal, and ecosystem health, calling for close collaboration across sectors to tackle global health challenges. It promotes a more integrated, sustainable strategy to address threats such as pandemics, antimicrobial resistance, and biodiversity loss. By recognizing the role of environmental and social factors, this definition encourages long-term, preventive solutions that benefit the health of people, animals, and the planet alike.

Read more

Intensive Care Unit Adults

Using Residual Blood from the Arterial Blood Gas Test to Perform Therapeutic Drug Monitoring of Vancomycin: An Example of Good Clinical Practice Moving towards a Sustainable Intensive Care Unit

A study from Erasmus MC's intensive care unit shows that residual blood from arterial blood gas (ABG) tests can be reliably used for therapeutic drug monitoring (TDM) of vancomycin. By switching to lithium heparin (LiHep) syringes, additional blood draws are avoided without compromising accuracy. This practice not only maintains patient safety but also reduces material use, staff time, and costs—contributing to a more sustainable ICU.

Read more

Towards Sustainability For Medical Devices and Consumables: The Radical And Incremental Challenges In The Technology Ecosystem

The article discusses the complex challenges in achieving sustainability within the medical technology ecosystem, emphasizing both radical and incremental changes needed to reduce environmental impact. Key issues include product design, procurement practices, regulatory barriers, and healthcare culture. The authors advocate for a systemic, collaborative approach across sectors to foster innovation and improve sustainability in medical devices and consumables.

Read more

Department of Pharmacy

Review of Scavenged Sampling For Sustainable Therapeutic Drug Monitoring: Do More With Less

This article explores the concept of scavenged sampling as a sustainable approach to therapeutic drug monitoring (TDM). By using leftover biological material from routine clinical procedures - such as residual blood or plasma - clinicians can monitor drug levels without requiring additional invasive sampling. Scavenged sampling offers a promising path to reduce waste, minimize patient burden, and promote more sustainable healthcare practices.

Read more

Department of Medical Microbiology

The Unintended Contribution of Clinical Microbiology Laboratories to Climate Change and Mitigation Strategies: A Combination of Descriptive Study, Short Survey, Literature Review and Opinion

This article explores how clinical microbiology laboratories unintentionally contribute to climate change through high energy use, single-use plastics, and cold storage. Despite their essential role in healthcare, the environmental impact of labs has received little attention. The authors call for greater awareness and institutional support to make laboratories more sustainable without compromising patient care or diagnostic quality.

Read more

2023

Department of Public Health

Planetary Health: A New Field of Research, Education and Practice

This article introduces planetary health as an emerging field that examines the interdependence between human health and the state of natural ecosystems. It highlights how global environmental changes - such as climate change, biodiversity loss, and pollution - pose growing risks to public health, particularly through impacts on food security, water availability, and the spread of infectious diseases. The author argues for integrating planetary health into research, education, and medical practice. He emphasizes the responsibility of the healthcare sector to reduce its own environmental footprint.

Read more

Planetary Health in Medical Education: Rapidly Catching Up

Healthcare professionals have a responsibility to protect both human health and the ecosystems that support it, making planetary health an essential part of medical education. As interest in the topic grows within postgraduate and continuing education, curricula should address three key themes: the human–nature relationship, clinical application, and the physician's societal role. Successful implementation requires stakeholder support, formal curriculum integration, institutional capacity, sufficient resources, and cross-disciplinary collaboration, with roles for everyone from students to education leaders.

Read more

Intensive Care Unit Adults

Circular Material Flow in the Intensive Care Unit —Environmental Effects and Identification of Hotspots

This study examines the environmental impact of the intensive care unit (ICU) and highlights the need to shift from a linear to a circular system. In 2019, 2,839 patients were admitted to the ICU at Erasmus MC, with an average stay of 4.6 days. A material flow analysis revealed that 247,000 kg of materials were used that year, of which 50,000 kg ended up as (hazardous) medical waste. The daily environmental impact per patient was 17 kg of material use, 12 kg CO_2-equivalents, 300 liters of water, and 4 m^2 of land use. Five environmental hotspots were identified: non-sterile gloves, isolation gowns, bed linen, surgical masks, and syringes (including packaging).

Read more

Size Does Matter. Sustainable Choice of Intravenous Bags

The environmental impact of intravenous (IV) bag selection in intensive care is highlighted in this publication. The authors argue that choosing smaller-sized IV bags when clinically appropriate can significantly reduce plastic waste and associated carbon emissions. This simple adjustment in medical practice presents a feasible and sustainable step toward greener healthcare without compromising patient care.

Read more

The Green Intensive Care: From Environmental Hotspot to Action

This publication addresses the significant environmental impact of intensive care units (ICUs) and advocates for a transition from a linear to a circular economy within healthcare. Through a material flow analysis conducted in an academic ICU, the study identifies key environmental hotspots—specifically, the use of gloves, gowns, and continuous renal replacement therapy (CRRT) bags. The findings underscore the necessity for systemic changes in ICU practices to reduce waste and carbon emissions, promoting sustainability without compromising patient care.

Read more

Department of Pulmonology

Global Access and Patient Safety in the Transition to Environmentally Friendly Respiratory Inhalers: The Global Initiative For Asthma Perspective

In this article the urgent need to balance environmental sustainability with equitable access and patient safety in the shift toward eco-friendly inhalers is discussed. Representing the Global Initiative for Asthma, the authors emphasize that while reducing the carbon footprint of inhalers is important, this transition must not compromise treatment effectiveness, affordability, or availability—especially in low- and middle-income countries. A patient-centered, evidence-based approach is essential to ensure safe and fair global implementation.

Read more

Department of Urology

A Green Prescription: Integrating Environmental Sustainability in Urology Guidelines

In response to the escalating climate crisis, this article underscores the imperative to embed environmental sustainability within urology clinical practice guidelines. The authors identify five key domains where targeted recommendations can significantly mitigate the environmental footprint of urological care. They advocate for urological societies to incorporate strategies that minimize ecological impact, thereby aligning clinical practices with global sustainability objectives.

Read more

2024

Pediatric Intensive Care Unit

Call For Sustainable Food Systems Including (Medical) Nutrition for Hospitalised Children and their Families

The climate crisis poses a major threat to child health, impacting fundamental rights such as access to food, water, healthcare, and education. While the healthcare sector emphasizes prevention, it also significantly contributes to greenhouse gas emissions and waste - particularly through (medical) nutrition. This review explores how plant-based alternatives, if nutritionally adequate and sustainably sourced, could reduce the climate footprint of medical nutrition. It also stresses the importance of effective food and nutrition waste management in clinical settings.

Read more

Department of Pharmacy

Effect of Alternative Dosing Strategies of Pembrolizumab and Nivolumab on Health-Care Emissions in The Netherlands: A Carbon Footprint Analysis

The study investigates how alternative dosing strategies (ADS) for the cancer immunotherapies pembrolizumab and nivolumab can reduce their environmental impact, particularly in terms of greenhouse gas emissions. Using a process-based lifecycle assessment at Erasmus MC, researchers found that pharmaceutical production accounts for the vast majority (over 92%) of emissions per dose, averaging 94 kg CO_2e. Implementing ADS led to a significant reduction in emissions—21–26% for pembrolizumab and 9–11% for nivolumab. These findings highlight the potential of ADS to make cancer treatment more sustainable and underscore the need for greener pharmaceutical manufacturing practices.

Read more

Intensive Care Unit Adults

Towards Greener ICUs: Redesigning the Use of Disposable Gloves

This study, part of the Green ICU initiative at Erasmus MC, addresses the high environmental impact of disposable gloves in intensive care. By redesigning the glove dispenser to release one glove at a time and reduce waste, the project offers a practical solution to lower glove use while maintaining hygiene standards.

Read more

The Paracetamol Challenge in Intensive Care: Going Green with Paracetamol

This publication discusses the significant environmental impact of intravenous (IV) paracetamol in intensive care units (ICUs). The authors highlight that administering 1 gram of IV paracetamol results in 628 grams of CO_2 emissions, compared to just 38 grams for oral administration. Recognizing this disparity, the ICU team initiated a “paracetamol challenge” to reduce IV paracetamol use by 25%. This initiative gained traction, with over 40 hospitals participating.

Read more

Five Sustainable Tips About Water in the ICU: Reduction of Water Use and Decrease of the Amount of Antibiotics in Wastewater

This article discusses strategies to reduce water usage and minimize antibiotic contamination in wastewater within intensive care units (ICUs). It emphasizes the importance of implementing sustainable practices to address environmental concerns associated with ICU operations. The authors propose five practical measures to achieve these goals, aiming to enhance both ecological sustainability and patient safety.

Read more

Reducing the Environmental Impact of Syringes at the Intensive Care Unit

The Erasmus MC Green ICU project aims to reduce the environmental impact of syringes by applying circular economy principles. A Material Flow Analysis identified syringes and packaging as major impact areas. The study found that impact arises from design, production, use, and disposal. Key interventions include changing infection protocols, waste separation, syringe redesign, and optimizing filling.

Read more

Environmental Sustainability in Intensive Care: The Path Forward. An ESICM Green Paper

This article presents strategies from the European Society of Intensive Care Medicine (ESICM) to make intensive care more environmentally sustainable by improving energy use, reducing waste, promoting sustainable purchasing, and raising staff awareness—all without compromising patient care.

Read more

Reducing Plastic Waste in Intensive Care From Longer Use of Intravenous Administration and Invasive Monitoring Sets: A Before-and-After Study

This study evaluated the impact of extending the routine replacement interval for intravenous administration and invasive monitoring line sets in the ICU from 4 to 7 days. The change resulted in a significant reduction of plastic waste, nursing workload, and costs without increasing catheter-related bloodstream infections (CRBSI). These findings support longer replacement intervals as a safe and effective strategy to reduce environmental impact in intensive care setting.

Read more

Department of Public Health

Research on the Health Impact of Climate Must Consider Distributive Justice and Environmental Sustainability

This article argues that research on the health impacts of climate change must proactively incorporate the ethical principles of distributive justice and environmental sustainability. The authors contend that addressing these considerations only after policy implementation diminishes effectiveness and overlooks opportunities to reduce carbon emissions. They advocate for embedding ethical frameworks early in the research and policy development processes, ensuring that health interventions are both equitable and environmentally responsible. Achieving this integration requires coordinated efforts across disciplines and sectors.

Read more

The Carbon Footprint of a Dutch Academic Hospital —Using a Hybrid Assessment Method to Identify Driving Activities and Departments

This study investigates the carbon footprint of a Dutch academic hospital using a hybrid assessment method that combines process-based life cycle assessment (LCA) with input-output analysis. The research identifies key activities and departments contributing to the hospital's environmental impact, providing insights into areas where emissions can be reduced. By integrating detailed operational data with broader economic models, the study offers a comprehensive view of the hospital's ecological footprint, highlighting opportunities for sustainable practices in healthcare settings.

Read more

The Global Health Community at International Climate Change Negotiations

This study explores critical factors influencing global health outcomes by analyzing recent data trends and policy impacts across multiple countries. It highlights key challenges such as healthcare access disparities, the effects of socioeconomic variables, and the role of international cooperation in improving health equity. The findings emphasize the importance of targeted interventions and robust health systems to address persistent inequalities and enhance overall population health.

Read more

The Biodiversity Impact of Health Care: Quantifying the Extinction-Risk Footprint of Health Care in The Netherlands and Other European Countries

This study quantifies the biodiversity impact of the health care sector in Europe, showing that the Netherlands has the highest per-capita extinction-risk footprint, largely driven by food and beverage supply chains. Health care contributes 4.4% to the Dutch consumption-related extinction risk, higher than the European average of 2.6%. Results highlight the need for targeted strategies to reduce health care's environmental impact across multiple indicators.

Read more

Drawing a Line from CO_2 Emissions to Health —Evaluation of Medical Students' Knowledge and Attitudes Towards Climate Change and Health Following a Novel Serious Game: A Mixed-Methods Study

A serious game introduced in the Erasmus MC curriculum in 2023 improved medical students' knowledge and attitudes about climate change and health. Surveys showed increased awareness of climate education's importance and a rise in climate worry. Focus groups revealed students' reflections on their roles, the value of peer learning, and appreciation of the game's clear climate-health overview.

Read more

Department of Surgery

Carbon Footprint in Trauma Surgery, Is There a Way to Reduce It?

This study assesses the carbon footprint of trauma surgery and explores potential strategies to reduce its environmental impact. By analyzing energy use, material consumption, and waste production during surgical procedures, the research identifies key contributors to greenhouse gas emissions within the operating room. The findings suggest that targeted interventions, such as optimizing resource use and adopting more sustainable practices, could significantly lower the carbon footprint of trauma surgeries without compromising patient care.

Read more

Department of Anesthesiology

Substantiating 'Green' Healthcare Decisions: An Explorative Life Cycle Assessment Study to Identify Differences in Greenhouse Gas Emissions Between General vs. Regional Anaesthesia for Upper Extremity Surgery

This publication discusses the growing importance of incorporating environmental sustainability into healthcare decision-making. It emphasizes the need for evidence-based approaches to support "green" healthcare initiatives, balancing patient outcomes with ecological impact. The authors advocate for systematic evaluation methods to substantiate sustainable practices within medical settings, aiming to reduce healthcare's carbon footprint while maintaining quality care.

Read more

2025

Intensive Care Unit

Include Environmental Sustainability in Clinical Trial Design and Implementation Strategies: The BLING-III Trial as an Illustrative Example

This article advocates for integrating environmental sustainability into clinical trial design and implementation, using the BLING-III trial as a case study. It emphasizes the importance of minimizing the environmental impact of research activities, such as reducing waste and energy consumption, and suggests incorporating sustainability assessments into trial protocols. The authors call for broader adoption of eco-friendly practices in clinical research to align healthcare innovation with global sustainability goals.

Read more

A Checklist For Environmentally Responsible Research Within The ICU

Growing concern about climate change underscores the need for sustainable practices in intensive care. This paper by ESICM introduces a checklist to help ICU researchers reduce and report the environmental impact of their work, aiming to standardize sustainability efforts and promote transparency in research.

Read more

The Green ICU: How to Interpret Green? A Multiple Perspective Approach

This article proposes a practical, three-step approach to improve environmental sustainability in intensive care units. It focuses on measuring environmental impact, involving stakeholders through collaboration and co-creation, and sharing results to build momentum. The framework is designed to support ICUs in implementing sustainable practices tailored to their local context, while maintaining high-quality patient care.

Read more

Nudging Intensive Care Unit Personnel Towards Sustainable Behaviour

This study explored whether behavioral nudges could reduce the use of disposable aprons in an intensive care unit as part of a sustainable policy. Despite previous success of such nudges in other settings, nudging did not result in a decrease in apron usage. The results underline the complexity of applying behavioral interventions in critical care and suggest that context-specific factors may limit their effectiveness.

Read more

Department of Anesthesiology

Waste and Cost Assessment of Total Intravenous Anesthesia in the Context of Environmental Sustainability: Insights From a Dutch Academic Hospital

This study by Rieff et al. examines the environmental impact and costs associated with total intravenous anesthesia (TIVA) in a Dutch academic hospital. The researchers quantify the waste and financial expenditures related to TIVA and place these findings within the broader context of sustainability in healthcare. The results offer valuable insights into how anesthetic practices can be made more environmentally and economically sustainable.

Read more

Department of Urology

Sustainability in Urology, Practical Tools for the Urologist

This article highlights the importance of sustainability in urology, presenting practical guidelines developed by "The Green Urologist" committee to promote eco-friendly practices in urological care, including an infographic for sustainable cystoscopy procedures.

Read more

Get Started Ecologically Sustainable in Urology

Sustainability in urology is gaining momentum, driven by the need to reduce the environmental impact of medical care. Measuring current practices is key to identifying effective changes. This publication highlights early steps, such as switching to reusable materials, using tap water for bladder irrigation, and promoting sustainable preventive care.

Read more

Department of Pharmacy

Environmental Impact Assessment of Intravenous Versus Subcutaneous Monoclonal Antibodies: A Carbon Footprint Analysis

This study compared the environmental impact of intravenous (IV) versus subcutaneous (SC) administration of pertuzumab/trastuzumab in oncology care. Using a bottom-up material analysis, researchers found that SC administration significantly reduced the carbon footprint compared to IV delivery. The findings suggest that adopting SC formulations where clinically appropriate can contribute to more sustainable oncology practices

Read more

Cost-Effective and Sustainable Drug Use in Hospitals: A Systematic and Practice-Based Approach

This publication outlines a structured strategy for optimizing pharmaceutical use in hospitals, balancing cost-efficiency with sustainability. It integrates evidence-based methodologies with real-world hospital practices to reduce waste, improve prescribing behavior, and enhance the long-term affordability and environmental impact of drug use. The approach emphasizes interdisciplinary collaboration, continuous monitoring, and tailored interventions.

Read more

Climate Therapy: Sustainability Solutions for Breast Cancer Care in the Anthropocene Era

Climate change negatively affects breast cancer care, especially for vulnerable groups, while healthcare itself is a major carbon emitter. To address this, an expert group developed a practical set of sustainable actions - summarized in a solution tree - that clinicians can apply in daily practice to reduce the sector's environmental impact.

Read more

Department of Gastroenterology and Hepatology

Endoscopic Sustainability PrimAry Reporting Essentials (E-SPARE): European Society of Gastrointestinal Endoscopy (ESGE) Position Statement

An increasing number of studies assess the environmental impact of gastrointestinal (GI) endoscopy, but the lack of standardized reporting hinders comparability and quality. To address this, the European Society of Gastrointestinal Endoscopy (ESGE) has developed a dedicated reporting framework to support researchers in producing clear, transparent, and consistent studies on sustainable GI endoscopy.

Read more

Carbon Footprinting and Environmental Impact of Gastrointestinal Endoscopy Procedures at a Tertiary Care Institution: A Prospective Multi-Dimensional Assessment

This study evaluates the environmental impact of gastrointestinal endoscopy procedures, focusing on greenhouse gas emissions and waste generation. It highlights that patient travel is the main contributor to emissions, with diagnostic procedures having a lower environmental footprint than therapeutic ones. The findings emphasize the importance of reducing patient travel, minimizing repeat procedures, and improving resource management to promote sustainable healthcare practices.

Read more