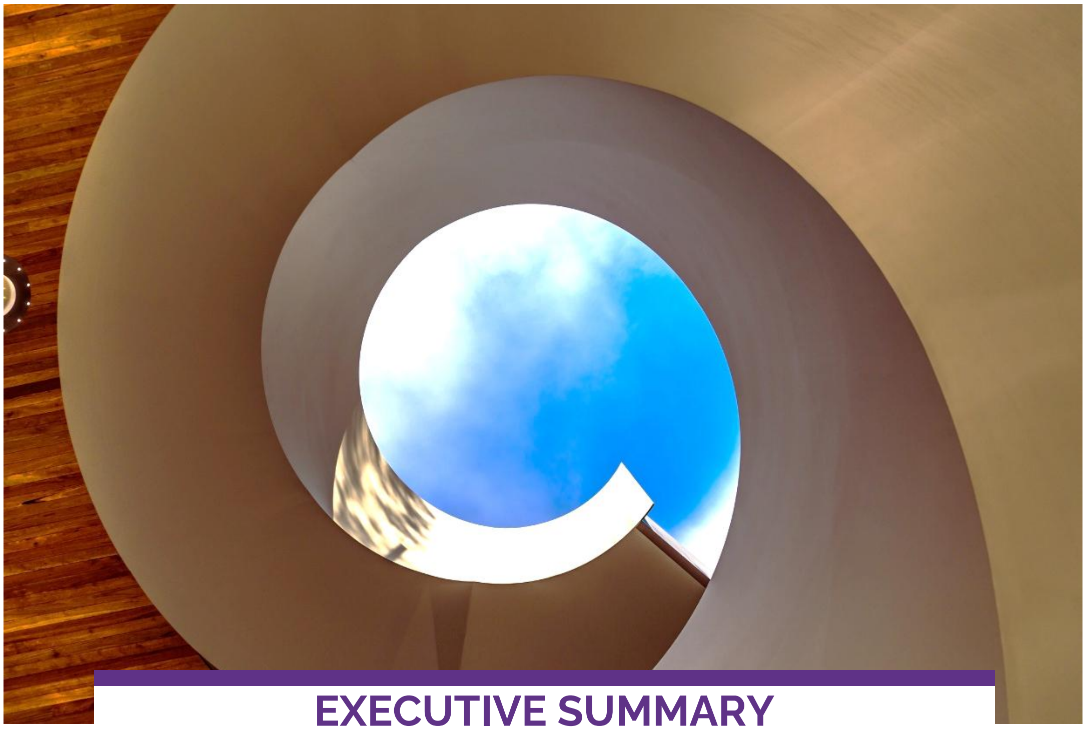
HPRC
HEALTHCARE PLASTICS RECYCLING COUNCIL

HPRC's Guidance on Life Cycle Assessments and their Applicability to Healthcare Systems

Contents



EXECUTIVE SUMMARY

The Healthcare Plastics Recycling Council (HPRC) aims to advance sustainability within healthcare systems by improving understanding and appropriate use of Life Cycle Assessments (LCAs). Engagement with hospital facility leaders, analysis of survey data, and discussions across the healthcare plastics and packaging value chain indicate that LCAs are widely recognized but not consistently understood or applied within healthcare decision-making.

This paper is intended as an educational resource for healthcare stakeholders who may be unfamiliar with LCA methodology. It explains the purpose and structure of LCAs, describes the most common LCA frameworks, and illustrates how LCAs can be applied within healthcare systems to support sustainability-driven decisions. The paper emphasizes the role of LCAs as decision-support tools that help organizations identify environmental hotspots, prioritize reduction efforts, and evaluate trade-offs across products, processes, and services.

Building on prior technical work evaluating the current state of LCAs in healthcare, HPRC highlights the importance of developing healthcare-specific inventory data, methodologies, and reporting practices. While such standardization continues to evolve, this paper demonstrates that appropriately scoped LCAs can already provide meaningful guidance to hospitals and healthcare systems. HPRC encourages healthcare organizations to use this document as a foundation for understanding LCAs and to engage qualified third-party experts when conducting or interpreting LCA studies.

INTRODUCTION

Sustainability is the practice of meeting today's needs without compromising the ability of future generations to meet their needs (United Nations, 2025). Sustainability in healthcare requires balancing patient care, operational reliability, and responsible use of resources. As healthcare systems work to reduce greenhouse gas (GHG) emissions, conserve materials, and minimize waste, decision makers increasingly need tools that provide credible, quantitative insight into environmental impacts.

Life Cycle Assessment (LCA) is one such tool. An LCA is a systematic methodology used to evaluate the potential environmental impacts of a product, process, or service across some or all stages of its life cycle (Kun-Mo Lee, 2004). Depending on the scope of the study, this may include raw material extraction, manufacturing, transportation, use, and end-of-life management. LCAs help organizations understand where environmental impacts occur, how different stages contribute to overall performance, and where improvement efforts are most likely to be effective (Matthews et al., 2014).

The healthcare sector is a significant contributor to resource consumption, waste generation, and GHG emissions. As awareness of these impacts grows, hospitals are seeking strategies to improve environmental performance without compromising patient safety or quality of care. LCAs support this objective by enabling evidence-based decision-making in areas such as procurement, facility operations, waste management, and clinical practice.

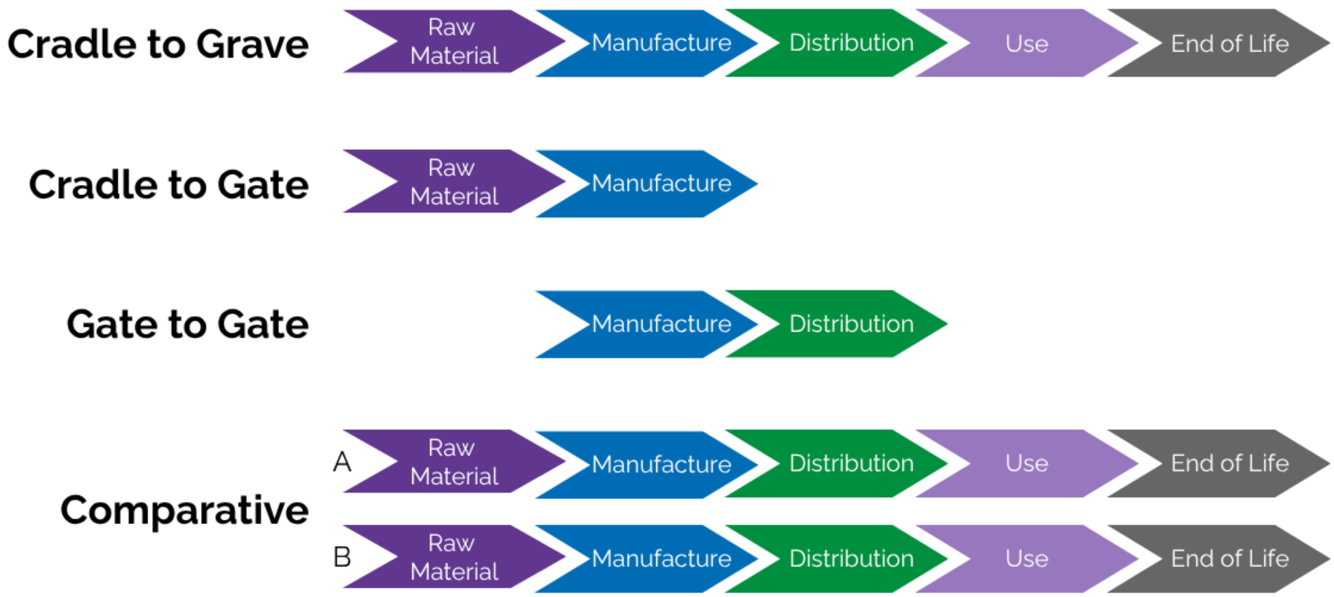
Despite their value, LCAs can be challenging for healthcare organizations to interpret and apply. Differences in scope, data quality, assumptions, and methodology can lead to confusion or misuse of results, particularly when comparing studies developed for different purposes. Through surveys and direct engagement with hospital representatives, HPRC has identified a clear need for practical guidance on how LCAs work, what questions they can reasonably answer, and how healthcare systems can use them effectively.

This paper addresses that need by providing an overview of LCA concepts, describing common LCA frameworks and standards, and presenting healthcare-relevant examples that illustrate how LCAs can inform sustainability strategy. The intent is not to promote a single approach, but to equip healthcare organizations with the foundational knowledge needed to evaluate LCA studies and apply their insights appropriately.

TYPES OF LIFE CYCLE ASSESSMENTS

LCAs are structured in different ways to cater to the purpose of the study (*see **Figure 1***).

Figure 1: Types of Life Cycle Assessments



- **Cradle to Grave LCA:** evaluates the entire lifecycle of a product from raw material generation to end-of-life disposal. This is the most comprehensive type of LCA and relies on both internal and external data capture, including Scope 1, 2, and 3 emissions.
- **Cradle to Gate LCA:** is often used to evaluate a product and identify "hotspots" in the production process. These hotspots will identify areas that have the greatest overall contribution to the environmental impact of the product and often help define where companies have the best opportunity for reduction.
- **Gate to Gate LCA:** narrows in on a single stage of manufacturing or distribution.
- **Comparative LCA:** can be used in any of the above approaches to evaluate the relative performance of two products. It is important to note that separate product LCAs should not be used for direct comparison. Comparative LCAs are specifically designed for that purpose and eliminate the potential uncertainties due to differences in databases, data quality, system boundaries, exclusions, and functional units. These factors make cross comparisons between separate LCAs unreliable, unless they are conducted within a single harmonized framework.

Ultimately, an LCA aims to provide a holistic view of the environmental impacts of a product throughout some or all of its lifecycle and is used to determine the greatest sources of impact within that life cycle. It reveals trade-offs between different phases of the product life cycle or different impact categories.

ISO STANDARDS & LCA METHODOLOGIES

The international standards ISO 14040:2006 and ISO 14044:2006 detail the requirements and framework for conducting LCAs. These widely recognized standards are complimentary, and both are required to conduct a compliant LCA.

ISO 14040:2006 defines four main phases of an LCA: goal and scope definition, life cycle inventory analysis (LCI), life cycle impact assessment (LCIA), and interpretation.

- Goal and scope definition is a critical first step in an LCA as it determines the purposes for carrying out the study, the intended audience, and use of the results. This phase also establishes the system boundary, assumptions, and function unit which impacts all other phases.
- The Life Cycle Inventory (LCI) phase of an LCA quantifies resource inputs alongside product, waste, or emission outputs for each process step in the life cycle. Results may focus on specific inventory categories such as water use or primary energy demand.
- The Life Cycle Impact Assessment (LCIA) phase translates the LCI data captured into potential environmental impacts such as global warming potential (GWP).
- The interpretation phase is used to summarize the findings from the LCI and LCIA phases and will identify issues, evaluate results, and provide conclusions, limitations, and recommendations that align with the initial LCA scope and goals.

ISO 14044:2006 provides detailed requirements and guidelines to execute an LCA, including the required critical review for the different types of LCAs. This standard gives detailed, specific guidelines and mandatory elements to conduct each phase. It outlines data quality requirements, data validation, critical review considerations, and allocation procedures. This standard helps to ensure rigor and reliability of LCA studies.

Widely used LCIA methodologies include the Tool for Reduction and Assessment of Chemicals and Other Environmental Impacts (TRACI), published by the United States Environmental Protection Agency (U.S. EPA), and the Centrum voor Milieueffecten (CML) method from the University of Leiden. These methodologies are used to calculate impact categories such as Global Warming Potential (GWP), acidification potential, eutrophication potential, ozone depletion potential, smog formation, human health impact, ecotoxicity, land use, and water use. It is important to note that these indicators represent potential impacts; they do not predict the actual fate of emissions or direct damage to endpoints such as ecosystems.

In evaluating an LCA, each impact category represents a unique environmental impact. Oftentimes a product may have a minimal impact on some categories and be high in others. Since there is not a formula to establish equivalency between categories, the user must base their determinations on which impact categories they value most. For example, one product may have a low impact on GWP but a high impact on acidification. The end user must decide which category is of most concern.

A growing trend is the request for a Product Carbon Footprint (PCF), which is at its essence an LCA of a product that only calculates GWP. This can be accomplished by evaluating the emissions from cradle-to-gate or cradle-to-grave, based on whether or not you are considering only the business-to-business framework or expanding to business to consumer. ISO 14067:2018 compliments the ISO 14040:2006 and ISO 14044:2006 standards and provides a narrow focus on how to determine the carbon footprint of products throughout their lifecycle.

LCAs draw on both primary data (collected directly from the manufacturer's operations) and secondary data (from published literature or LCA databases). An LCA may be limited by the availability of primary data or secondary data that accurately represents the true population with appropriate geographical and technological coverage, and time relevancy. Unit processes, such as raw material extraction or transport, are the smallest element in the LCIA analysis for which input and output data are qualified for a single step. While an LCA may evaluate the potential environmental impacts of different scenarios, it does not typically address their economic feasibility or define implications to human or animal labor.

Uncertainty is an inherent feature of any LCA due to data gaps, assumptions, and variability in methods. ISO standards outline approaches to evaluate uncertainty, but in practice, differences of less than 20% in LCI GHG emission results are generally considered inconclusive. This threshold helps prevent over interpretation of marginal differences and comparative studies (Matthews, 2014).

In addition to process-based LCAs, another approach is the Economic Input Output Life Cycle Assessment (EIO-LCA). This streamlined tool relies on financial transaction data between economic sectors and environmental releases from each sector (Michalek et al., 2011). The advantages of an EIO-LCA are that it is quick and often based on publicly available databases such as the EPAs Environmentally Extended Input-Output (EEIO) tables. The disadvantage is that it assumes a linear relationship between the amount of emissions released from a sector and the economic value of the output of that sector. This is a good type of LCA to identify hotspots, or areas where a product may have the largest portion of emissions.

APPLICABILITY TO HOSPITALS AND HEALTHCARE SYSTEMS

Healthcare systems can utilize different types of LCAs to support their intended purposes. An Organizational Life Cycle Assessment (O-LCA) could be used to map the total environmental footprint of a hospital. This type of LCA would seek to identify areas in which the hospital is having the largest impact on an environmental life cycle indicator, such as GHG emissions. Hospitals can use this data to identify key areas of impact and concentrate their sustainability efforts and reduction goals accordingly.

A strong example of this type of LCA is the *Environmental foot printing of hospitals: Organizational life cycle assessment of a Canadian hospital* by Alexander Cimprich and Steven B. Young (2023). Their analysis found that electrical consumption was the largest contributor to GHG emissions at the hospital they studied. As a result of their LCA findings, they were able to prioritize a shift towards operational efficiencies to reduce environmental damage.

Hospitals can also use product level LCAs from their supply chain when available. These may be cradle-to-gate or cradle-to-grave and can provide data relevant to Scope 3, Category 1 (purchased goods and services). However, that level of recordkeeping can be challenging given the sophistication required for Scope 3 emissions. Product LCAs often provide valuable insight into the environmental impacts of different disposal methods, which can inform the design of a more sustainable waste management system. Many entities use the EEIO tables for their Scope 3 data. EEIOs use financial data to calculate the GHG emissions of products and services. They are used in EIO-LCAs, and often as secondary data in LCAs where primary data is not available.

LCAs can also be used to highlight the environmental impact of a particular healthcare procedure or process to guide evidence-based decision making. Although these types of LCAs are difficult to translate from one hospital to another as there are many differences in hospital operations (i.e. procedures, supply chains, and standard practices), these LCAs often highlight practices such as device reuse, which can help reduce environmental impacts. An LCA of a hospital department can be used to highlight how to use equipment more efficiently and effectively to reduce emissions as well.

LCA STUDIES REVIEWED

This section summarizes LCA studies relevant to healthcare systems that demonstrate how LCAs can support sustainability decision-making. HPRC conducted a literature review using selection criteria that included study quality, relevance to healthcare operations, methodological rigor, and applicability to real-world decision contexts.

Content in this section is informed by the technical report *Use of Life Cycle Assessment in the Healthcare Industry: Environmental Impacts and Emissions Associated with Products, Processes, and Waste* (Sharma et al., 2024), with the intent of communicating a harmonized and consistent message. The examples below illustrate specific ways LCAs can add value to healthcare systems across procurement, operations, waste management, and policy development.

1. Evidence Based Decision Making

LCA provides hospitals with quantitative data on the environmental impacts of their operations. This evidence supports informed decisions about procurement, facility design, and clinical practices. Numerous LCA studies demonstrate that reusable and reprocessed medical devices often have lower environmental impacts than single-use alternatives, providing hospitals with defensible, data-driven guidance for sustainable procurement decisions.

Stryker LCA Study

Stryker commissioned a comparative LCA of five single-use medical devices (SUDs) and their reprocessed counterparts (DeSchamps, 2023). The goal was to quantify and compare the carbon footprint (CFP) of original manufacturing versus reprocessing, following ISO 14067 standards. The study covers the entire life cycle (cradle-to-grave) of each device, including raw material extraction, manufacturing, packaging, transportation, reprocessing, and end-of-life disposal. The reduction in GHG emissions seen from reprocessing ranged from 23% to 51% depending on the device:

- Max-A: 51% lower
- ViewFlex: 49% lower
- HARH36: 46% lower
- LF2019: 33% lower
- MyoSure REACH: 23% lower

The study identifies the main driver of GHG emissions:

- For original SUDs, the largest contributor to carbon footprint is the production of raw materials and components (especially plastics, metals, and circuit boards).
- For reprocessed SUDs, the main contributors are packaging, cleaning/decontamination, some replacement parts, and transportation to sterilization. However, these impacts are still much lower than those from manufacturing new devices.

The Stryker LCA study provides strong, evidence-based support for hospitals to adopt reprocessing of single-use medical devices as a strategy to reduce their environmental impact. The findings are robust across a range of scenarios and highlight actionable areas for further improvement. For healthcare systems, this study demonstrates how LCA results can be used to justify supplier selection, expand reprocessing programs, and support internal sustainability targets with ISO-aligned evidence.

Institute for Energy and Environmental Research Heidelberg LCA Study

Institut für Energie-und Umweltforschung Heidelberg gGmbH (Institute for Energy and Environmental Research Heidelberg) conducted an LCA comparison of a multilayer pouch and high-density polyethylene (HDPE) bottle in the research article, Life *Cycle assessment of Packaging Systems for Enteral Nutrition Products: Multilayer Pouch and High-Density Polyethylene Bottle* (Krueger et al., 2021). This study compared a full cradle-to-grave LCA with consideration to different end-of-life scenarios for each package type. Following ISO 14040/14044 principles and considering various markets for the study (Europe, Latin America, and Australia), Krueger et al. found that the multilayer pouch was more environmentally favorable than the HDPE bottle.

The report effectively reviews the assumptions and boundaries of the study. This study utilizes the updated mechanical recycling rates for HDPE bottles of 15%. This was established with reference data and input from German-based hospitals and disposal companies on recycle rates for bottles used in eternal nutrition products at the time of the study. This recycling rate is notably less that the overall average recycling rate of 30% for the European region as of 2018. Other end of life scenarios assumed either incineration and/or landfill based on the region. This study also looked at two different weights of HDPE bottles for each scenario, including a 'light' bottle and 'heavy' bottle option to compare to the multilayer pouch.

Notably, the study tested multiple end-of-life scenarios and sensitivity analyses, including increased HDPE recycling rates and varying bottle weights, yet the multilayer pouch remained favorable across all scenarios. This reinforces the importance of evaluating material efficiency alongside recyclability when making packaging decisions in healthcare.

2. Identification of Environmental Hotspots

By analyzing each stage of a product or process, LCA helps hospitals identify hotspots; points in the life cycle with the greatest environmental burden. This enables targeted interventions, such as optimizing energy use in operating rooms, reducing unnecessary single-use items, or improving waste segregation and recycling

German Hospitals Dietary Quality and Environmental Footprint LCA

An LCA study was commissioned by two hospitals (located in northern and eastern Germany) and three nursing homes (located in northern, eastern, and southern Germany) (Pörtner et al., 2025). The study assessed both the dietary quality and the environmental footprint of foodservice across the five facilities in Germany. Using detailed procurement and recipe data, the researchers applied LCA methods to quantify impacts across five environmental indicators including land use, GHG emissions, acidification, eutrophication, and water use.

The study identified the specific hotspot based on the food animal source:

- **Bovine (beef) and pig meat** had the highest impacts across all indicators.
    - 38% of GHG emissions.

- 33 - 45% of other environmental impacts (land use, acidification, eutrophication, water use).

- **Dairy** was the second largest contributor, responsible for 18 - 40% of environmental impacts, mainly due to high purchases of milk and cheese.
- **Fish** contributed disproportionately to eutrophication (up to 17% in some institutions), but less to other indicators.
- **Coffee and tea** contributed 5 - 8% of overall land use, GHG emissions, and eutrophication impacts
- **While plant-source foods (vegetables, grains, starches)** made up most of the procurement by weight and calories, their share of the environmental footprint was much smaller (13 - 20%).
- **Legumes and nuts**, key plant-based protein sources, made up less than 1% of total procurement by weight, indicating missed opportunities for lower-impact protein sourcing.
- **Ultra-processed foods** may have underestimated impacts due to limitations in the LCA database used.

This study clearly identifies food procurement, particularly red meat and dairy, as the dominant environmental hotspot in healthcare foodservice. From a decision-making perspective, it provides hospitals with a strong evidence base to revise menus, supplier requirements, and nutrition policies in ways that improve both environmental and patient health outcomes.

3. Resource Efficiency and Cost Savings

LCAs can reveal opportunities to increase resource efficiency, which often translates into cost savings. They can also look at hospital departments and identify areas for improving efficiencies in practices which translates to emissions reductions and cost savings.

University Hospital Würzburg - Gastrointestinal Endoscopy LCA

The University Hospital Würzburg, Germany commissioned a cradle-to-gate LCA for their Gastrointestinal Endoscopy unit which performs 8,000 procedures per year. This System LCA focuses on a specific clinical process, allowing the hospital to understand emissions drivers at the procedure level. An example of a System LCA is *Assessment of the yearly carbon emission of a gastrointestinal endoscopy unit* (Henniger et al., 2023). This study uses ISO 14040 framework to find the total GHG emission of a gastrointestinal endoscopy. The total GHG emission is specific to the region (i.e. Germany) and hospitals that were used in this study. This cradle-to-gate LCA includes investigation into Scope 1, 2, and 3 emissions up to the point of waste leaving the endoscopy procedure. This includes local emissions during the operation, energy production, and consumables like packaging and transportation.

This example resulted in lower-than-expected overall GHG emission, partially driven by the University Hospital using 100% regenerative sources for their electrical energy. Henniger, et al., include some comparisons that are useful for other hospitals that may utilize different energy sources. For example, they state "For scope 2, it is certainly advisable to check which type of electricity is used. If no green electricity was procured, emissions would increase by more than 30%." It was calculated the overall GHG emissions were relatively low at 62.72 tons per year.

The study illustrates how LCAs can uncover both environmental and cost-saving opportunities, particularly when hospitals evaluate energy sourcing, consumable use, and procedural efficiency together.

Environmental Life Cycle Assessment of a U.S. Hospital-based Radiology Practice

This study of a U.S. hospital's radiology practice looked at the diagnostic radiology services over a ten-year period and on a per scan basis to estimate GHG and other emissions (Thiel et al., 2024). The study was conducted using ISO 14040 methodology. It included MRI, CT, radiography, fluoroscopy, and the equipment used in the medical center to image all patients including inpatient, outpatients, and emergency departments. Single use supplies, linens, pharmaceuticals, semidurable supplies as well as patient monitoring equipment were also included in the study.

The LCA determined environmental hotspots and suggested possible interventions. A hotspot identified that the imaging equipment was often in a higher than necessary scan mode, resulting in higher energy use. Suggested interventions would be to optimize scheduling, increase patient throughput, and power down equipment when not in use. As the energy used by imaging equipment was a major source of emissions, the LCA suggested interventions of incorporating renewable energy, looking to manufacturers for technological innovations to decrease energy use, and finding optimization of exam protocols to reduce scanning times.

Surprising categories of impact were linens, supplies, and pharmaceuticals. A more selective use of hospital linens, and type of linens would lessen impacts. Eliminating unnecessary supplies, and looking for recyclable replacements, along with protocols to decrease pharmaceutical waste would also have positive impacts.

4. Support for Circular Economy Initiatives

Hospitals generate large volumes of waste, much of which is potentially recyclable or reusable. LCAs support the transition to a circular economy by quantifying the benefits of reprocessing single-use devices, recycling materials, and designing products for multiple life cycles. This not only reduces waste but also lessens the demand for virgin resources.

Supporting Circular Economies through Medical Remanufacturing

Fraunhofer-Gesellschaft with a sponsored research agreement with industry partner Vanguard AG, Germany commissioned an LCA study to assess the environmental impacts and circularity of remanufacturing single-use electrophysiology catheters, comparing remanufactured catheters to virgin (newly manufactured) ones (Schulte, 2021). The study combines LCA with a circularity metric to evaluate both short-term (single product cycle) and long-term (multiple cycles) environmental impacts.

The study introduces a circularity metric that measures how many times a product is used before disposal, providing a quantitative way to evaluate remanufacturing systems. In the modeled circular system, catheters are used on average 2.09 times (remanufactured 1.09 times).

It concluded that remanufactured catheters reduce Global Warming Impact (GWI) by 50.4% compared to virgin catheters. Abiotic (water, air, soil, etc.) resources use is reduced by 28.8%. In 13 out of 16 environmental impact categories, remanufacturing showed significant benefits (>20%) over virgin production. The main environmental savings come from avoiding virgin plastic production and processing.

This approach equips hospitals with credible data to support circular procurement models, supplier partnerships, and regulatory discussions.

5. Benchmarking and Monitoring Progress

LCA provides a baseline for hospitals to measure and monitor the effectiveness of sustainability interventions over time. By repeating LCAs after implementing changes, hospitals can track reductions in emissions, waste, and resource use, ensuring continuous improvement.

Canadian Hospital O-LCA

A Canadian Hospital commissioned an Organizational LCA (O-LCA) to comprehensively evaluate a hospital's environmental footprint over its entire organization. A great example of this is *Environmental foot printing of hospitals: Organizational life cycle assessment of a Canadian Hospital* (Cimprich & Young 2023). This O-LCA is of a 40-bed hospital in British Columbia, Canada for its fiscal year of 2019. The hospital used ISO 14072:2014 standards to guide this O-LCA. This standard adapts LCA framework for organization-level assessments. The system boundary of this O-LCA included energy and water inputs, medical product supply chains, pharmaceuticals, patient diets, goods and transportation, housekeeping and linens, and patient transportation. The outputs were from the emissions and waste streams. Given the large number of purchased products (2,927), the study used statistically robust sampling methods and economic input-output data to represent product categories.

The O-LCA calculated effects for the following categories: GWP, acidification potential, smog formation potential, respiratory effects, ozone depletion potential, eutrophication potential, human toxicity (carcinogenic and non-carcinogenic) ecotoxicity, and fossil fuel depletion. In all categories except ozone depletion potential, the greatest impact was caused by energy (natural gas, electricity, fuel oil) and water use. Although this is representative of this hospital, it demonstrates how a hospital could find which inputs have the greatest impact. This type of LCA can help guide hospitals to devoting their resources to where they can have the most impact.

O-LCA is a powerful tool for hospitals to establish environmental benchmarks, monitor their sustainability performance over time, and guide targeted improvements. The study demonstrates how a robust, statistically informed O-LCA can underpin evidence-based sustainability management in healthcare.

6. Stakeholder Engagement and Policy Development

Implementing LCAs requires collaboration among all stakeholders, including clinicians, administrators, suppliers, and waste management service providers. This engagement fosters a culture of sustainability and can inform the development of hospital policies, procurement standards, and even national regulations for environmental reporting in healthcare.

Life Cycle Sustainability Assessment (LCSA) of Healthcare Buildings: A Policy Framework

King Saud University, Riyadh, Saudi Arabia commissioned an LCA study to assess 124 public hospitals in Pakistan, comparing their sustainability performance to a LEED-certified hospital (H19) (Ullah et al., 2023). It evaluates environmental (ELCA), social (SLCA), and economic (LCC) impacts per hospital bed, providing a holistic view of sustainability. The goal is to inform and guide policy makers in developing sustainable healthcare infrastructure, especially in developing countries.

The study uses a causal loop diagram (CLD) to visualize the interdependencies between sustainability indicators (cost, environmental, social). This systems approach helps policy makers understand trade-offs and synergies such as how improving energy efficiency can reduce costs and emissions but may require upfront investment.

In summary, the study concluded in the following challenges in public hospitals:

- Inadequate management and planning
- Political interference
- Insufficient staffing and funding
- High energy consumption and expenses
- Outdated building designs and codes
- Lack of maintenance and inefficient operations
- Poor indoor air quality, comfort, and patient satisfaction

The study used this evidence-based approach to make the following policy recommendations:

- Integrate LCSA into hospital design, construction, operation, and maintenance
- Update building codes to require energy-efficient and sustainable practices
- Mandate regular energy audits and maintenance for public hospitals
- Encourage use of renewable energy and recycled materials in new and existing buildings
- Develop laws and guidelines for medical waste management and disposal
- Invest in staff training and management systems to foster a sustainability culture
- Ensure government funding and support for sustainability initiatives in healthcare

LCSA is a powerful tool for policy makers to benchmark, monitor, and improve the sustainability of healthcare buildings. The study demonstrates how LCSA can translate complex sustainability data into actionable policy frameworks for healthcare infrastructure worldwide.

HPRC ANALYSIS OF HEALTHCARE FACILITY ADVISORY BOARD SURVEY DATA

In an effort to understand how hospitals are using LCAs, and how HPRC can contribute to the utilization of this tool, we conducted a roundtable discussion with representatives from multiple hospitals at the 2025 CleanMed conference. To boost our understanding, HPRC also conducted a survey amongst members of our Healthcare Facility Advisory Board (HFAB) with a focus on LCAs.

The survey found that although all the HFAB members are aware of LCAs, the majority of them are not using them for traditional sustainability topics such as environmental baselines, reporting, goal setting, or compliance purposes. Half of the survey respondents were using LCAs in their decision-making processes, mainly by the sustainability and procurement teams. Half of the respondents are utilizing LCAs supplied by their vendors, and the majority did not use any guidelines, such as ISO standards, in analyzing their data. None of the respondents indicated that they were verifying any of the LCA output data. Finally, 75% percent of respondents are interested in receiving more education and information on LCAs. These findings reinforce the need for standardized guidance, third-party validation, and targeted education to ensure LCAs are accessible, executed, interpreted, and applied correctly in healthcare decision making.

WHAT TO LOOK FOR IN AN LCA

When reviewing LCAs for suitability, the following elements should be considered:

- Complies with the ISO 14040:2006 (Environmental Management – Life Cycle Assessment Principles and Framework) and ISO 14044:2006 (Environmental Management Life Cycle Assessment Requirements and Guidelines) standards.
- The data being used aligns with the stated goal and purpose of the assessment.
- Clearly states who is commissioning the LCA study, and any potential conflict of interest. For example, "findings are intended to be used comparatively, or publicly, or to identify hotspots or for marketing purposes."
- The functional unit is a measure which clearly and quantitatively relates to the inputs and outputs studied and is relatable to your interests.
- LCA data is geographically relevant and timely to your interests. If the data is from another continent, the results may not be relative to your interests. Similarly, if the data is very old, it may no longer be relevant.
- The LCA is transparent in their assumptions, methodology, and analysis of the data.
- The LCA has addressed the uncertainty in the data.
- The LCA was reviewed in a critical review process by an internal or external expert, or panel of interested parties as prescribed in ISO 14044:2006.

COMPANIES THAT CAN HELP WITH COMPLETING LCA ANALYSIS

The following companies are included to highlight the types of organizations that can support Life Cycle Assessment analysis in healthcare. HPRC does not evaluate, rank, or endorse service providers, and readers are encouraged to conduct their own due diligence.

Intertek

Intertek is a global leader in Total Quality Assurance, with over 44,000 employees across more than 100 countries. Their sustainability division, Intertek Assuris, offers comprehensive LCA services aligned with ISO 14040 and ISO 14044 standards.

LCA Expertise for Hospitals:
Intertek's LCA services help hospitals understand the environmental, social, and economic impacts of their operations and procurement decisions. Their assessments support:

- Sustainable procurement and supply chain optimization
- Facility and equipment lifecycle impact analysis
- Compliance with green building certifications (e.g., LEED, WELL)
- Environmental Product Declarations (EPDs) for medical products

Value to Hospital Management:
Hospitals can leverage Intertek's expertise to reduce carbon and water footprints, enhance brand reputation, and meet regulatory and stakeholder sustainability expectations. Their global reach and robust data systems make them ideal for multi-site hospital systems in both the U.S. and EU.

Long Trail Sustainability (LTS)

LTS is a boutique sustainability consultancy based in Vermont, USA, with a small but highly specialized team providing LCA support services for the United States. They are the North American distributor of SimaPro, a leading LCA software, and developers of the DATASMART Life Cycle Inventory database tailored to North American data.

LCA Expertise for Hospitals:
LTS offers ISO-compliant LCA services, carbon accounting, and sustainability training. Their services are ideal for hospitals seeking:

- Customized sustainability strategies
- Product and packaging footprint analysis
- Staff training in sustainability and LCA
- Integration of life cycle thinking into hospital operations

Value to Hospital Management:
LTS's personalized approach and deep expertise make them a strong partner for hospitals aiming to embed sustainability into their culture and operations. Their training programs can empower hospital staff to lead internal sustainability initiatives and improve environmental performance.

Eurofins Sustainability Services

Eurofins is a global scientific leader with over 61,000 employees in over 900 laboratories worldwide. Their sustainability division offers a wide range of services including LCA, carbon footprinting, and supply chain transparency.

LCA Expertise for Hospitals:
Eurofins provides detailed LCA services that help hospitals:

- Benchmark medical products and services
- Identify environmental hotspots in operations
- Develop credible sustainability claims and reports
- Improve procurement decisions and waste management

Value to Hospital Management:
Eurofins' robust analytical capabilities and global presence make them ideal for large hospital networks. Their LCA services can support strategic planning, regulatory compliance, and ESG reporting, helping hospitals in both the U.S. and EU meet ambitious sustainability targets.

Sphera

Sphera is a global leader in integrated risk management and sustainability consulting, with a strong focus on product sustainability. Their team leverages 20,000+ DEKRA-verified LCA datasets and advanced software tools to deliver science-backed environmental insights. Sphera operates globally, serving clients across industries including healthcare, manufacturing, and chemicals.

LCA Expertise for Hospitals:
Sphera's consultants help hospitals conduct LCAs and PCFs to:

- Identify environmental hotspots in medical products and operations
- Support EPDs for hospital equipment and supplies
- Align with EU and U.S. sustainability regulations (e.g., CSRD, Ecodesign)
- Integrate circularity and decarbonization strategies into procurement and facility design

Value to Hospital Management:
Hospitals can use Sphera's tools and consulting services to improve sustainability reporting, reduce emissions, and meet buyer and regulatory expectations. Their sector-specific expertise and scalable solutions make them ideal for large hospital networks aiming to embed sustainability into operations and supply chains.

SimaPro (Now Part of One Click LCA)

SimaPro, developed by PRé Sustainability, is one of the most trusted LCA software platforms globally. It is now part of One Click LCA, forming the world's largest LCA ecosystem with over 500,000 datasets and users in 170+ countries. The combined platform supports compliance with major sustainability standards and regulations.

LCA Expertise for Hospitals:
SimaPro offers robust modeling tools and integration capabilities that allow hospitals to:

- Assess environmental impacts of medical devices, pharmaceuticals, and facility operations
- Integrate LCA into enterprise systems for real-time sustainability metrics
- Comply with EU directives (e.g., CSRD, Ecodesign) and U.S. ESG frameworks
- Scale LCA from individual products to entire hospital portfolios

Value to Hospital Management:
SimaPro enables hospital teams to make data-driven decisions that reduce environmental impact and improve operational efficiency. Its transparency, scientific rigor, and integration with enterprise systems make it a powerful tool for sustainability officers, procurement teams, and facility managers.

CONCLUSION

HPRC identified a need to expand healthcare industry knowledge and practical guidance related to Life Cycle Assessments. When appropriately scoped and interpreted, LCAs provide a scientifically grounded way to understand environmental impacts across healthcare products, processes, and systems. Rather than serving as exact measurements, LCAs function most effectively as decision-support tools that help organizations identify priorities, evaluate trade-offs, and focus sustainability efforts where they can achieve the greatest benefit.

Adoption of LCA in healthcare is not without challenges. Limited availability of healthcare-specific data, resource constraints, and variation in methodologies can affect the consistency and comparability of results. Continued development of healthcare-specific LCA databases, methodological guidance, and reporting standards will be essential to improving confidence and usability across the sector.

In the interim, healthcare systems can derive meaningful value from LCAs by clearly defining their objectives, selecting LCA types aligned with those objectives, and engaging qualified external experts when needed. By applying life cycle thinking thoughtfully and consistently, healthcare organizations can strengthen sustainability strategies, support informed procurement and operational decisions, and reduce environmental impacts while maintaining high standards of patient care.

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About HPRC

HPRC is a private technical coalition of industry peers across healthcare, recycling, and waste management industries seeking to improve the recyclability of plastic products within healthcare. Made up of more than 30 brand-leading and globally recognized members, HPRC explores ways to enhance the economics, efficiency, and ultimately the quality and quantity of healthcare plastics collected for recycling in support of a circular plastics economy. HPRC is active across the United States and Europe working with key stakeholders, identifying opportunities for collaboration, and participating in industry events and forums. For more information, visit www.hprc.org and follow HPRC on LinkedIn.