ASP SUMMIT

CONTINUOUS MEDICAL EDUCATION WEBINARS

Circular Economy on MD Reprocessing

a roadmap for new solutions

2022

CME WEBINARS

SERIES # 3

ASP Advanced Sterilization Products

Factsheet

ASP SUMMIT
CONTINUOUS MEDICAL EDUCATION WEBINARS

intro

EVERY DAY, TONES OF HEALTHCARE WASTE ARE PRODUCED WORLDWIDE, CONTRIBUTING TO APPROXIMATELY 4-5% OF TOTAL GAS EMISSIONS.[1,2] THE ONGOING COVID-19 PANDEMIC DRAMATICALLY INCREASED THIS NUMBER. PERSONAL PROTECTIVE EQUIPMENT (PPE) USE, SUCH AS MASKS, GOWNS AND GLOVES, MOST OF THEM DESIGNED FOR SINGLE USE, AS WELL MASS TESTING AND VACCINATION RELATED PROCEDURES CONTRIBUTED LARGELY FOR THIS INCREASE.[3]

According to a study, in 2020, up to 3.4 billion single use masks were discarded each day.[4] Several strategies can be adopted to reverse this situation, which include: reduction in the amount of unnecessary PPE, increasing reusable and regionally made PPE, and better PPE made with biodegradable compounds; better packaging use; more recycling systems for general healthcare waste; reverse logistics and centralized treatment of waste using non-burn technologies.[5]

In the healthcare sector, the application of Circular Economy, which can be defined as a systems solution framework that tackles global challenges like climate change, biodiversity loss, waste, and pollution, must be regarded as an important opportunity for achieving a better Planet and for a new way of economic growth and profits.[6]

In the 3rd webinar series, "Circular Economy in Medical Devices reprocessing: a roadmap for new solutions" that followed the success of the "Challenges of Medical Device reprocessing", a series of five live webinars were organized between May 2022 and November 2022, covering the most relevant topics related to medical device reprocessing and circular economy. Each webinar consisted of a summary of the characterization of attendees, followed by the main presentation by the invited expert, including polls that allowed great interaction, and ended with a Q&A session. Each speaker was carefully selected according to the subject, resulting in an international panel from Portugal (Lindsey Wuisan, MSc), Netherlands (Professor Jeremy Faludi Ph.D.), Australia (Dr. Victoria McCreanor, Ph.D.), France (Mrs. May Karam) and Italy (Eng. Jonathan Hart). A sixth webinar was held in January, with the participation of all the experts in a round table format, highlighting the previously expressed ideas. The webinars had a total of 1163 attendees from 99 different countries. A high satisfaction rate of 93,4% was attained.

References

1. Pichler P, Jaccard IS, Weisz U, Weisz H. International comparison of health care carbon footprints. Environ Res Lett. 14(6):064004. 7. 2. Health Care Without Harm, Arup. Health care's climate footprint. Health Care Without Harm; 2019. 3. Global analysis of healthcare waste in the context of COVID-19: status, impacts and recommendations. Geneva: World Health Organization; 2022. Licence: (CC BY-NC-SA 3.0 IGO). 4. Benson NU, Bassey DE, Palanisami T. COVID pollution: impact of COVID-19 pandemic on global plastic waste footprint. Heliyon. 7(2):e06343. 5. https://www.who.int/news-room/fact-sheets/detail/health-care--waste 6. https://ellenmacarthurfoundation.org/topics/circular-economy--introduction/overview

THIS E-BOOK SUMMARIZES THE WEBINAR SERIES, HIGHLIGHTING THE RESULTS OF THE POLLS AND KEY TAKEAWAYS OF EACH WEBINAR.

factsheet

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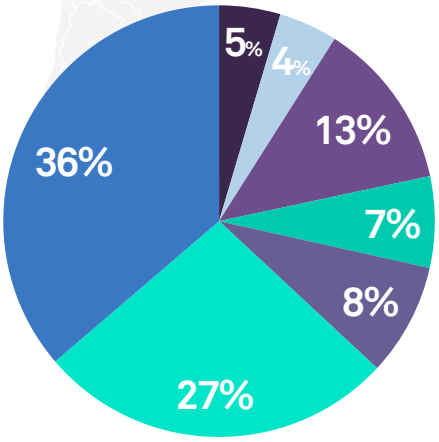
CONTINUOUS MEDICAL EDUCATION WEBINARS

TOTAL
1163
REGISTRANTS

TOTAL
99
COUNTRIES REPRESENTED

TOTAL
2060
QUESTIONS ANSWERED



professions

- Infection Prevention & Control Specialist
- Decontamination Lead / Manager
- Physician
- Other
- Clinical Sales / Production Specialist
- Healthcare Manager
- Nurse

WEBINARS global Statistics

Factsheet

THIS STATISTICS ARE AN INSIGHTFUL SUMMARY OF OUR **ASP SUMMIT WEBINARS** ON THE CIRCULAR ECONOMY!

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circular economy

2022 CME WEBINARS SERIES # 3

in Healthcare sector: AN OVERVIEW

1 webinar

Lindsey Wuisan, MSc

EXPERT ON CIRCULAR ECONOMY AND ENVIRONMENTAL POLICY

CIRCULAR ECONOMY PORTUGAL, LISBON

ENVIRONMENTAL IMPACTS DUE TO LINEAR PRACTICES IN HEALTHCARE

The healthcare industry is among the most carbon-intensive service sectors[1]. It is responsible for 4.4–4.6% of worldwide greenhouse gas emissions and about the same proportion of air pollutants[2]. These emissions arise directly from health care facilities, as well as indirectly from the supply chain of healthcare goods and services. During the past 30 years the health care industry has become increasingly reliant on single-use (disposable) medical devices, particularly in high-income countries[3]. Of the total amount of waste generated by healthcare activities, about 85% is general, non-hazardous waste, while the remaining 15% is hazardous material that may be infectious, chemical or radioactive[4]. Most of this waste (both hazardous and non-hazardous) is not separated nor recycled, but rather incinerated or landfilled. This leads to a waste of resources, pollution (of air, soil and water) and costs, exacerbating resource depletion, biodiversity loss, climate change, and eventually also impacting human health[5,6].

"A linear economy leads to ecological destruction by depleting natural resources, generating (unrecyclable) waste, pollution and GHGs"

CIRCULAR ECONOMY IN THE HEALTHCARE SECTOR

A Circular Economy is a new paradigm to achieve sustainable production and consumption and preserve natural resources. In contrast to a linear economy (take-make-waste), a circular economy is regenerative by intention, by closing cycles just like in nature. A circular economy is achieved through innovative business models that avoid excessive resource use, design out waste and pollution, while maintaining and creating value for society and the environment. Meanwhile, the use of toxic chemicals and fossil fuels are also eliminated. Thus, a Circular Economy goes beyond efficiency, but achieves eco-effectiveness through systems thinking.

"A CE is a regenerative system in which the use of natural resources is minimized, waste and pollution are prevented through innovative business models"[7]

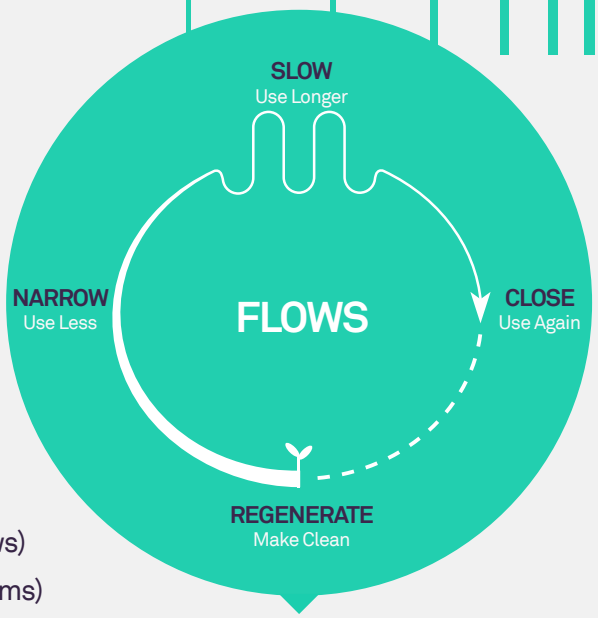
"the circular economy is key to achieve sustainable development"

MAIN CIRCULAR PRINCIPLES

a circular economy revolves around the following five principles:

1. Minimise resource use and extraction (narrow flows)
2. Use resources longer, extend product life (slow flows)
3. Optimal resource recovery through high-quality recycling (close flows)
4. Ecosystem stewardship (prevent pollution and regenerate ecosystems)
5. Create economic and social value equitably

Source: Bäunker, Lena, "Circular consumption in the linear economy: only a drop in the ocean?" https://www.circle-economy.com/blogs/circular-consumption-in-the-linear-economy-only-a-drop-in-the-ocean October 14, 2020



From Bocken's framework of Flow strategies that guides designers and business strategies in the move from a linear to a circular economy.

Circular Strategies that reduce resource use and maintain value:

Smarter product use and manufacture	R0 Refuse	Make a product redundant: abandon function or use different product
	R1 Rethink	Make a product use more intensive: sharing or multi-functional products
	R2 Reduce	Consume less through efficient manufacturing or use
Extend lifespan of products and its parts	R3 Re-use	Re-use of functioning discarted products by another use
	R4 Repair	Repair and maintenance of defects to keep original function
	R5 Refurbish	Restore and update
	R6 Remanufacture	Use parts in a new product with same function
	R7 Repurpose	Use products or parts in a new product with a different function
Useful application of materials	R8 Recycle	Process material to obtain the same (high grade) or lower (low grade) quality
	R9 Recover	Incineration of material with energy recovery

Source: Potting , José et al., "Circular economy: measuring innovation in the product chain", https://www.pbl.nl/sites/default/files/downloads/pbl-2016-circular-economy-measuring-innovation-in-product-chains-2544.pdf, January 2017

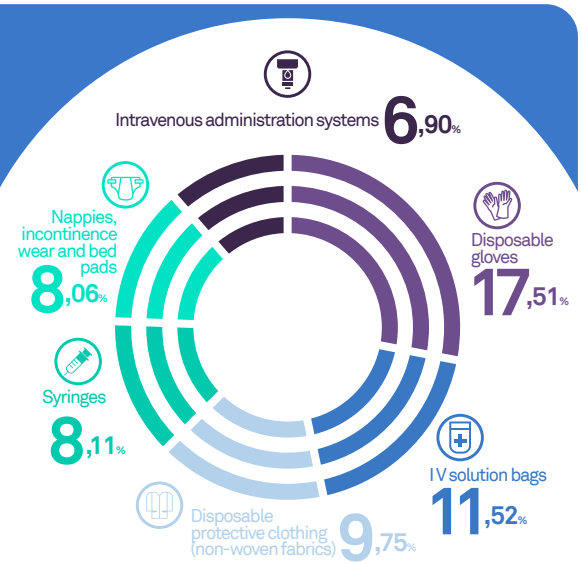
CIRCULAR STRATEGIES

When implementing these strategies, the focus should always be on upstream solutions, rethinking and redesigning product-service systems so to extend product lifespan and maintain value of components and materials for as long as possible. This also requires new business models (performance-based) and collaboration throughout the supply chain. Philips[8] for instance provides trade-in schemes for medical equipment (e.g. MRI systems, patient monitors and ventilators) to be refurbished. In the end, this should lead to zero waste to landfill or incineration.

"In a circular economy, emphasis is on upstream design solutions that extend product lifetime (design for reuse, repair, remanufacturing) and enable high-quality recycling"

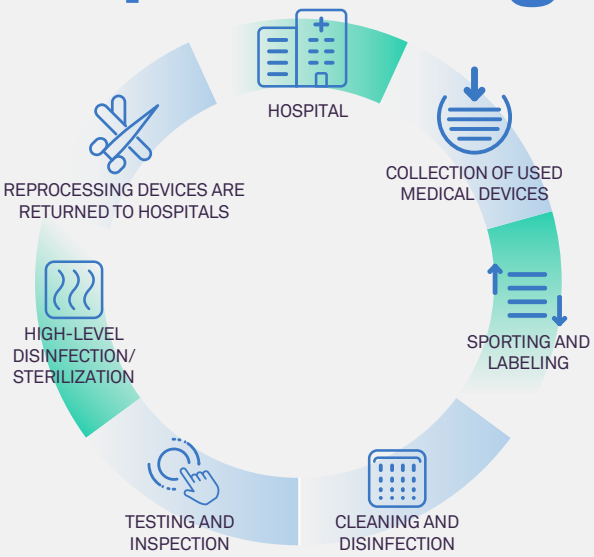
Circular Design: designing out waste and pollution

"Reuse" is key in a circular economy. Currently, the healthcare sector uses significant amounts of single-use plastic packaging and (protective) materials, such as disposable clothing, gloves etc. Most of these could be substituted by reusable items, as long as an efficient system is established to take back, process and sanitise after use. More information: Plasticsfree Healthcare[9].



Source: P.14, Measuring and reducing plastic in the healthcare sector. (2021)

Medical Devices reprocessing



Source: Healthcare Without Harm, "On the road to circular healthcare - reusing medical devices" https://noharm-europe.org/articles/news/europe/road-circular-healthcare-reusing-medical-devices, March 25, 2021

A specifically important strategy for the healthcare sector is "reprocessing", which refers to a process carried out on a used device in order to allow its safe reuse. It includes its cleaning, disinfection, sterilisation and related procedures, as well as testing and restoring the technical and functional safety of the used device[10].

There are various types of medical devices, which have different potential for reprocessing and reuse. Low-complexity devices that are difficult to clean (e.g. intravenous catheters, tubing, syringes, and needles) pose practical challenges for reuse. High-complexity devices on the other hand, such as medical imaging equipment, are usually designed for long lifespans and maintained with cycles of maintenance, repair, and refurbishment. In between are devices for which circular design coupled with reprocessing protocols offers the possibility of maintaining product integrity[11]. The more complex the device, the higher the economic and environmental savings of maintaining product integrity. Design strategies for circular medical products[12] are still under development, but have a lot of potential to transform the sector.

Reprocessing enables circular practices in the healthcare sector

CIRCULAR MEASURES FOR HEALTHCARE INSTITUTIONS

There is a wide array of practical measures that healthcare institutions can take in order to apply circular strategies in practice, whether during the construction of buildings or the operational management on a daily basis. Many circular and sustainable measures, e.g. energy and water-saving, reducing food waste and improving recycling, are not only better for the environment but also help save costs. Furthermore, public institutions have the responsibility to apply strict sustainability criteria in their procurement processes (e.g. for medical devices, protective clothing and other materials), which should also integrate circular criteria (e.g. circular design free from harmful substances). Healthcare institutions can also improve the direct surroundings by creating healthy, green spaces (e.g. green rooftops, vertical gardens).[13]

> **"The healthcare sector has to reduce its ecological footprint by using less disposables and using more reusable medical devices"**

> **"The Circular Economy is an opportunity to save costs."**

$21,724,304

WAS SAVED THROUGH **REDUCED WASTE** DISPOSAL

by hospitals that reprocessed single-use medical devices in 2019.

Source: AMDR, "Reprocessing by the numbers",2019 Annual Survey AMDR, http://amdr.org/wp-content/uploads/2021/02/AMDR_ReprocessingByNumbers_FINAL_web.pdf?utm_source=newsroom&utm_medium=article&utm_campaign=renewalearthday&utm_term=&utm_content=4222021

HEALTH BENEFITS FROM A CIRCULAR ECONOMY

A recent report by the World Health Organisation[14] analyses the implications of a circular economy for human health. In general, many positive health impacts are expected from reducing the use of primary resources, maintaining the highest value of materials and products and shifting towards renewable energy. Particularly (in)direct benefits will arise from improved resource-efficiency and reduced environmental impacts by manufacturing processes (e.g. improved air, soil and water quality, less GHG). However, negative health impacts are still a reality due to substances of concern in products (e.g. bisphenol A and brominated flame retardants in electronic equipment). Therefore, these have to be phased out by policies and regulations, stimulating manufacturers to adopt circular design practices without harmful substances.

Resume

Linear practices in the healthcare sector lead to significant waste production, greenhouse gases and other forms of pollution. There is a lot of potential to reduce the ecological footprint of healthcare institutions, which starts by eliminating single-use materials and disposable medical devices. **By switching to reusable medical devices instead, the healthcare sector can reduce costs and be part of the transition to a circular economy.**

take home messages

01 In a linear economy, the overexploitation and use of (natural) resources lead to significant environmental harm.

02 The healthcare sector also has a significant ecological footprint and generates a lot of waste, largely due to the widespread use of single-use disposables (materials and devices).

03 A CE is a regenerative system in which the use of natural resources is minimized, and waste and pollution are prevented, through innovative business models and sustainable modes of production and consumption.

04 In a circular economy, emphasis is on **upstream design solutions that extend product lifetime (design for reuse, repair, remanufacturing) and enable high-quality recycling, while regenerating ecosystems.**

05 **The healthcare sector can reduce its ecological footprint by using fewer disposables and adopting circular practices. These contribute to sustainable development, create socio-economic opportunities, improve public health and cut costs at the same time.**

1 Pichler PP , Jaccard IS , Weisz U , Weisz H . International comparison of health care carbon footprints. Environ Res Lett. 2019;14(6):064004. Crossref, Google Scholar. 2 Health Care Without Harm. Health care's climate footprint: how the health sector contributes to the global climate crisis and opportunities for action [Internet]. Reston (VA): Health Care Without Harm; 2019. 3 MacNeill et al., "Transforming The Medical Device Industry: Road Map To A Circular Economy" https://www.healthaffairs.org/doi/10.1377/hlthaff.2020.01118, December 2020 4 WHO, "Health-care waste", https://www.who.int/news--room/fact-sheets/detail/health-care-waste,8 February 2018 5 Eckelman et al. (2020) "Health Care Pollution And Public Health Damage In The United States: An Update" Health Affairs Vol. 39, No. 12: Climate & Health. 6 The growth in medical waste may even pose a threat to public health (Pitt; Kovach, Lindenberg, 2021) 7 Ellen Macarthur Foundation, https://ellenmacarthurfoundation.org/publications , 2013 8 Philips, "Philips Circular Edition systems", retrieved 23/May/2022, https://www.philips.com.au/healthcare/solutions/philips-circular-systems 9 Gamba, Arianna, "Towards plastic-free healthcare in Europe" , retrieved 23/May/2022, https://noharm-europe.org/issues/europe/towards-plastic-free-healthcare-europe 10 European Commission, retrived 23/May/2022, "Reprocessing of medical devices", https://ec.europa.eu/health/medical-devices-topics-interest/reprocessing-medical-devices_en 11 MacNeill et al., "Transforming The Medical Device Industry: Road Map To A Circular Economy" https://www.healthaffairs.org/doi/10.1377/hlthaff.2020.01118, December 2020 12 Kane, G.M. et al., "Towards design strategies for circular medical products" https://www.sciencedirect.com/science/article/pii/S0921344917302094, August 2018 13 Grisay, Laurent., "How can we design an urban hospital according to circular economy principles?", retrieved 23/May/2022, https://archipelago.be/en/projects/how-can--we-design-an-urban-hospital-according-to-circular-economy-principles/ 14 WHO, "Circular economy and health: opportunities and risks (2018)", retrieved 23/May/2022, https://www.euro.who.int/en/publications/abstracts/circular-economy-and-health-opportunities-and-risks-2018 , 2018.

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QUESTIONS & ANSWERS

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1 webinar

THE PURPOSE OF THE WEBINAR WAS TO HAVE A GENERAL OVERVIEW OF CIRCULAR ECONOMY IN HEALTHCARE AND AN INTRODUCTION TO THE 2018 WHO REPORT

"Circular economy and health: opportunities and risks".

CONCEPT & DEFINITIONS, STRATEGIES AND OPPORTUNITIES.

Attendees were asked to answer to several polls during this webinar.

HOW WOULD YOU CHARACTERIZE YOUR LEVEL OF KNOWLEDGE ABOUT THE CIRCULAR ECONOMY?

- 48% Limited
- 23% Average
- 16% Non-existent
- 13% High

DOES YOUR INSTITUTION HAVE AMBITIOUS SUSTAINABILITY POLICIES THAT ADDRESS WASTE PREVENTION, REUSE AND OPTIMAL RECYCLING (LESS INCINERATION)?

- 30% YES
- 17% NO
- 53% Somewhat (could be better)

DOES YOUR INSTITUTION ACTIVELY PROMOTE AND IMPLEMENT REUSABLE MEDICAL DEVICES?

- 24% NO
- 48% OFTEN
- 28% RARELY

WHICH MEASURES ARE ALREADY (SUCCESSFULLY) APPLIED IN YOUR INSTITUTION?

- 29% Lifetime extension of medical equipment
- 27% Reducing single-use plastics
- 25% Waste separation and recycling
- 9% Sustainable Procurement
- 9% Reducing food waste

WHAT DO YOU THINK ARE THE MAIN BARRIERS FOR A CIRCULAR ECONOMY IN THE HEALTHCARE SECTOR?

- 39% Economic barriers (investment costs)
- 18% Regulatory barriers
- 16% Lack of political will and management support
- 16% Practical and technological challenges
- 11% Cultural perceptions and ehaviours

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The role of Medical Device Reprocessing in

circular economy

2022 CME WEBINARS SERIES # 3

OPPORTUNITIES AND PITFALLS

Eng. Jeremy Faludi, PhD
ASSISTANT PROFESSOR OF SUSTAINABLE DESIGN ENGINEERING
TU DELFT, NETHERLANDS

2 webinar intro

Medical device industry values safety, as it should. But throwing away entire products just to avoid cleaning them creates air pollution, water pollution, and other waste that damage people's health.
Healthy people require a healthy planet. Don't just treat the patient in the room, treat the other 8 billion patients in the world as well.

Reusing products can save much more impact & money than merely recycling.

SAVE IMPACT

The UK NHS found most of their CO_2 footprint is in their supply chain. Around 25% is just product manufacturing--larger than building energy, water & waste, patient travel, or staff commute.
7% of the UK's entire carbon footprint is the health care industry, so we can make a big impact.
Even full remanufacturing of Medical Devices (MD) can cut CO_2 in half, and mere sterilization is even better.
There are many other kinds of impacts, beyond carbon (acidification, particulate emissions, radiation, and more).
Impacts of transport are usually very small versus manufacturing new products.[1]

SAVE MONEY

The "Value hill" diagram shows how more environmental value and financial value are saved by reducing, reusing, and remanufacturing versus recycling.
Recycling is the bottom of the barrel, saves the least (both environmentally & financially).
Cost savings can be large: a single hospital's neurosurgery dept. saved CAN$750,000/yr by reducing disposables 30%.

> *A Circular Economy is more than just recycling. Before that, we need to reduce consumption, repair, reuse, refurbish, and remanufacture, to save both environmental impacts and money."*

The dilemma of

single use VS multiple use

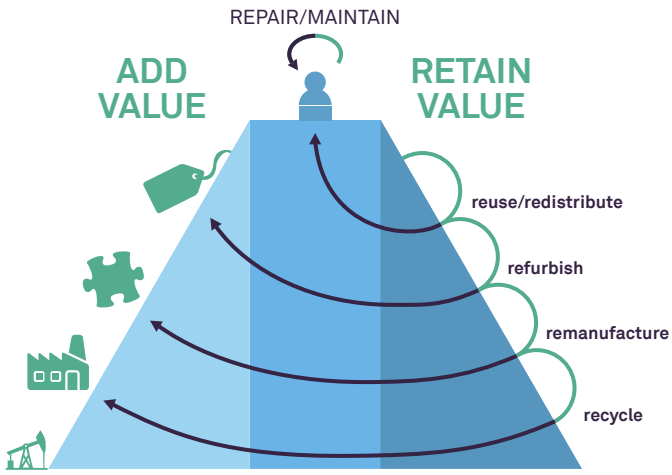
Different products have different impacts in disposal versus sterilization, and some products are easier / safer to reuse than others. Not all are better to reuse. We need to check product-by-product or at least category-by-category to make good purchasing decisions & good design policy.

For Circular Economy (CE) and if reusable MD are available, reprocessing/re-sterilization plays on decreasing medical waste with important savings associated.

BARRIERS TO REUSE & CIRCULAR ECONOMY IN MEDICAL DEVICES

The main barriers to a CE in MD are reverse logistics (getting products back), safety (sterilization), and regulations on material handling (which sometimes prevent handling / reuse even when safe).
Product service systems can overcome the business barriers, to save you the hassle & sometimes save costs.

"Value Hill"



Toronto Western Hospital neurosurgery dept. saved CAN$750,000/yr by reducing disposables 30%.[3]

Barriers to circularity are real, but we can do it.

How to improve the industry?

IMPROVE INDUSTRY BY INTEGRATING SUSTAINABILITY INTO PRODUCT & SERVICE DEVELOPMENT

There are specific tools & methods for implementing the CE in design, engineering, & business. For example, Life Cycle Assessement (LCA), whole system mapping, biomimicry, product service system types, persuasive design. Free tutorials.[2]

Manufacturers must design circular products/services.

"Current economics drives manufacturers toward planned obsolescence, but they must switch business models and design methods to drive the Circular Economy."

How to improve the industry?

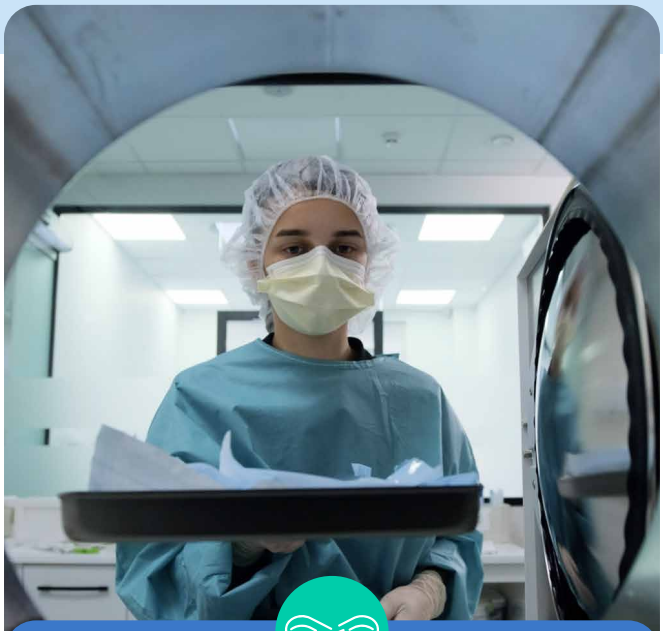
Improve industry by green purchasing

All hospitals have purchasing departments, and many hospitals have technology assessment depts.; the assessors should learn LCA or circularity metrics.
You don't necessarily need to do your own LCAs, but to require them of suppliers, and make purchasing decisions based on them. Both to find the best options and to avoid greenwashing.

> ***Purchasers have leverage, both in buying more sustainable products based on LCA or other quantified impact assessments, and subscribing to new business models like product service systems. If companies don't offer them, push them to provide the data and/or the business models."***

ASSESSMENTS TO KNOW

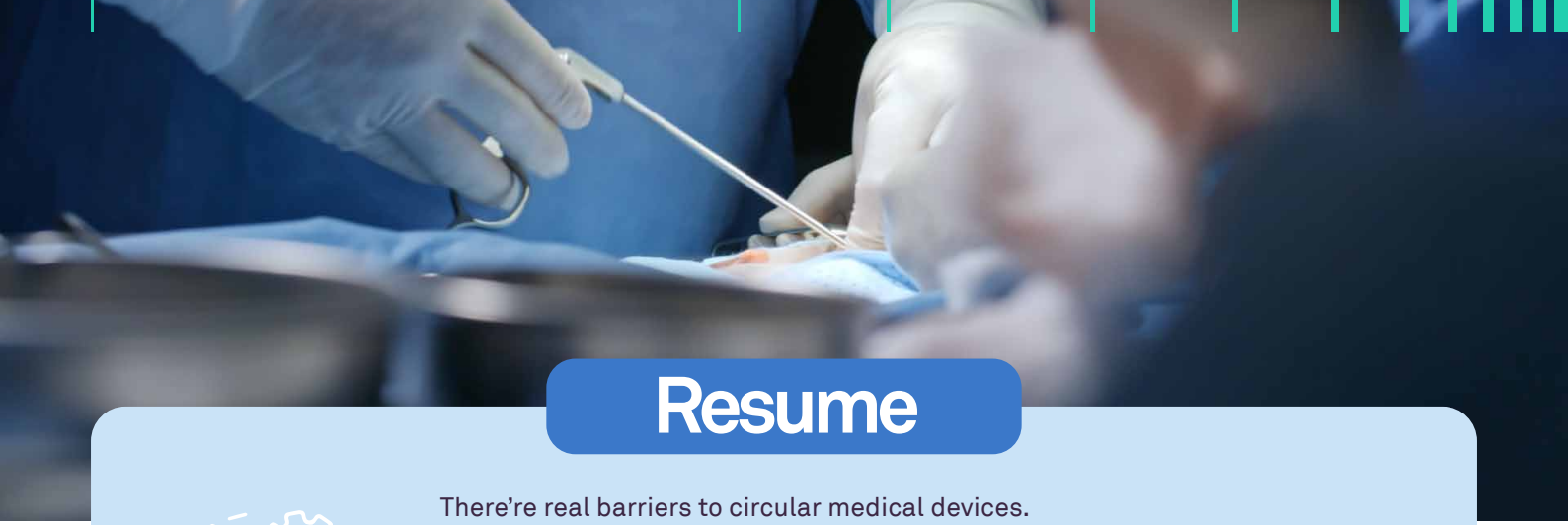
LCA quantifies environmental impacts-carbon footprint and much more.
Make fair comparisons by counting environmental impacts per unit of functionality / service, not per product.[4]
Circularity metrics, e.g., Cradle to Cradle material reutilization index, count how much is recovered from one product life to the next.[5]
Toxicity hazard scores measure 20 different hazards, but we need better data.[6]
Repairability & durability scorecards measure how long your products can last; they're already legally required for some product types in France.[7]



Buyers must be integrated into purchasing decisions.

PURCHASERS HAVE LEVERAGE

Purchasers create the demand for what MD companies produce.
You can create demand not only for circular products, but circular business models (like product service systems). Circular product design fails without supporting business models.



Resume

There're real barriers to circular medical devices.

There're tools & methods to both design better medical device systems, and to calculate their environmental effectiveness.

Even if you don't use these tools yourself, you can be aware of them, and learn how to use them in your purchasing / contracting / business partnerships.

We need to do this, to treat the other 8 billion patients on the planet. Healthy people require a healthy world.

take home messages

01 A circular economy is more than just recycling. Before that, we need to reduce consumption, repair, reuse, refurbish, and remanufacture, to save both environmental impacts and money.

02 Barriers to circular economy medical devices are real, but they can be overcome. We need to overcome them, because healthy people require a healthy world.

03 Current economics drives manufacturers toward planned obsolescence, but they must switch business models and design methods to drive the circular economy.

04 Purchasers have leverage, both in buying more sustainable products based on LCA or other quantified impact assessments, and subscribing to new business models like product service systems. If companies don't offer them, push them to provide the data and/or the business models.

1 Examples shown from http://productdesign.green. 2 Free tutorials are available on https://VentureWell.org/tools_for_design/introduction. 3 Blackwell, T. (2015, July 30). Showing surgeons 'massive' cost of disposable supplies leads to big savings for hospitals. National Post. https://nationalpost.com/news/canada/showing-surgeons-massive-cost-of-disposable-supplies-leads-to-big-savings-for-hospitals. 4 VentureWell Tools for Design and Sustainability, https://venturewell.org/tools_for_design/introduction/. 5 Cradle to Cradle Products Innovation Institute, https://www.c2ccertified.org/get-certified/product-certification. 6 Data from Pharos Project, https://pharosproject.net. 7 Data from Ritsma, R. (2022). The Cost of Ownership Tool: The Quantitative spreadsheet-based Cost of Ownership Tool, with an accompanying labelling scheme. Masters thesis, TU Delft. https://repository.tudelft.nl/islandora/object/uuid%3Af03f3f37-7085-48fa-91bd-40e2b136a24e.

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QUESTIONS & ANSWERS

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2 webinar

THE PURPOSE OF THE WEBINAR WAS TO UNDERSTAND THE IMPACT OF **Circular Economy the reprocessing of single and multiple use medical devices** (SUD & RMD). IDENTIFY CHALLENGES AND UNMET OPPORTUNITIES FOR CIRCULAR DESIGN IN THE MEDICAL SECTOR. ANALYZE THE KEY FACTORS AFFECTING CIRCULAR MEDICAL DESIGN: STERILIZATION REQUIREMENTS, DEVICE VALUE AND THE ORGANIZATIONAL SUPPORT STRUCTURE AROUND THE DEVICE.

As for webinar 1, attendees were asked to answer to several polls during this webinar.

ARE YOU APPLYING CIRCULARITY TODAY?

- 15% — I apply circularity to over 50% of my use / buying / design decisions
- 12% — I apply circularity to over 20 - 50% of my use / buying / design decisions
- 33% — I apply circularity to over 10% of my use / buying / design decisions
- 27% — I sometimes think about it, but can't do anything
- 12% — I usually never think about it.

WHAT'S THE BIGGEST ENVIRONMENTAL IMPACT FOR THIS PRODUCT (ELECTROPHYSIOLOGICAL DIAGNOSTIC CATHETER / SUD)?

- 34% — End of life
- 32% — Materials & manufacturing
- 17% — Electricity use
- 17% — Packaging

WHAT NUMBER SHOULD YOU ASK FOR?

- 35% — Environmental impact per cup of coffee produced
- 26% — Environmental impact per cup of coffee drunk
- 13% — Environmental impact per kg CO2 equivalent
- 13% — Environmental impact per 250 mL of coffee drunk
- 3% — Environmental impact per km of transport

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Economic considerations for Medical Devices reprocessing technologies in a Circular Economy

2022 CME WEBINARS SERIES # 3

webinar 3

Dr Victoria McCreanor, PhD
HEALTH ECONOMICS RESEARCH FELLOW, AUSTRALIAN CENTRE FOR HEALTH SERVICES INNOVATION (AusHSI), QUEENSLAND UNIVERSITY OF TECHNOLOGY
BRISBANE - AUSTRALIA

intro

WHEN MAKING DECISIONS ABOUT INVESTMENT IN NEW TECHNOLOGY OR SERVICES IN HEALTHCARE, IT IS IMPORTANT TO CONSIDER A RANGE OF FACTORS. MAKING A DECISION BASED ONLY ON WHAT IS "CHEAPEST" OR "BEST" MAY BE SHORT-SIGHTED. OFTEN THERE IS MORE TO A PRODUCT OR SERVICE THAN WHAT YOU SEE UP FRONT.

Economic evaluation allows both costs and effectiveness to be considered together, and modelling can take into account different time frames or uncertainty, to enable comprehensive understanding of the impact of different choices. The principles can be applied to issues of carbon footprint such as energy, water use and waste.

Image: https://pixabay.com/photos/drugs-pills-tablets-stethoscope-1961431/

The evaluation of both the ongoing costs and outcomes related to a new product or service is important as many countries are now spending close to 10% of GDP on health. Spending more means less money for other public services including education, and infrastructure such as roads. **Spending more does not guarantee better outcomes.**

If we fail to consider both costs and effects when investing in new technology, we may inadvertently **draw resources away from other services which generate good outcomes for patients or the health system.** The principles behind health economic evaluation of treatments and services can be applied to other decisions to **help understand the costs and consequences of choosing different types of sterilization systems.**

Key factors in health economic evaluation

- **benefits** OF EACH OPTION
- **costs** RELATED TO EACH OPTION
- **timeframe** APPROPRIATE
- **uncertainty** IN ESTIMATES OF COSTS AND BENEFITS – ENABLES A MORE COMPLEX ANALYSIS

Image: https://www.pexels.com/photo/photo-of-person-wearing-protective-wear-while-holding-globe-4167541/

STERILIZER FACTORS TO CONSIDER

"The key factors to consider when examining the costs and carbon footprint associated with different sterilizers are: energy consumption, water consumption, effect on or damage to instruments, disposable or single use consumable items."

When thinking about the carbon footprint related to consumables, it is important to consider the impact of their production and disposal, the choice of reusable versus single-use wraps, pouches and trays.

Case Studies of steam sterilizers

Case studies have shown that steam sterilizers use large amounts of electricity and water, even when idle. The examination of electricity use of steam sterilizers in a Melbourne hospital when on standby, accounted for 40% of the total energy use over 304 days.[1]

In **another study**, it was found that switching off idle sterilizers could reduce energy use by 26% and water use by 13%, and **reduced annual CO_2 emissions by 79 tons.**[2]

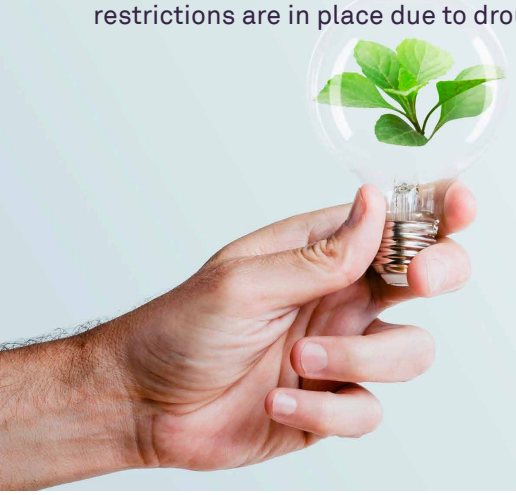
Image: https://www.pexels.com/photo/syringes-in-thermoforming-packagings-7722565/

Case Studies of low-temperature sterilizers

A case study of low-temperature (hydrogen peroxide gas plasma) sterilizers with an average 8.4M2 per day showed that while there were additional per-cycle costs of consumables (€6.51/US$6.46), sterilant (€19.58/US$19.44) and testing (€1.03/US$1.02), the energy use was much lower. For one year of average use at 8.4M2 per day, the low temperature systems used between 3.7kWh and 10 kWh, compared to 32kWh for a similar steam sterilizer.[3]

INCREASING COSTS OF ELECTRICITY AND WATER

There have been dramatic increases in the cost of electricity due to the war in the Ukraine. It is expected that prices will continue to increase. Use of electricity is therefore also costly from a financial perspective, as well as contributing to the carbon footprint. The costs of water are also increasing and in some places restrictions are in place due to drought conditions.



In a world affected by climate change and drought, as well as increasing energy prices due to war and other factors, it is important to moderate use of these resources where possible.

MONTHLY ELECTRICITY PRICES[4] (€/KWH)	2020	2022	(%)
Italy	47,46€	441,74€	+931%
Germany	34,98€	315,26€	+901%
France	37,97€	400,95€	+1056%

Source: Monthly electricity prices in selected EU countries 2020-2022; Published by Bruna Alves; Aug 23, 2022 | https://www.statista.com/statistics/1267500/eu-monthly-wholesale-electricity-price-country/

INSTRUMENT FACTORS TO CONSIDER

Different sterilization methods have different effects on medical instruments. In particular, instruments made of plastics, corrosion-susceptible metal alloys and electrical devices are affected by high temperature and humidity. Steam sterilization may damage such instruments meaning they need to be repaired or replaced more frequently. Repairs and replacement also have an effect on carbon footprint because of the energy and other resource requirements needed to repair instruments, make new parts or devices.

Image: iStock photo database accessed on 20220914: iStock-1327356968

Case Studies in **damage** to endoscopes and cost of repairs

A **case study on the frequency of damage** to rigid endoscopes when a hospital changed from using steam to a low-temperature system, showed a **33% reduction in the number of repairs and a 58% reduction in the number of repairs per procedure.**[5]

***Across 7 different studies of endoscope repairs**, the average cost was $US 3,749.35 per repair. Substantial savings can be made by reducing the frequency of damage to instruments like endoscopes:*

1. Landman J, Lee D, Lee C, Monga M. Evaluation of overall costs of currently available small flexible ureteroscopes. Urology 2003;62:218-22.
2. Mahawongkajit P, Techagumpuch A, Auksornchat K. Effects of basic endoscopic handling and care training on gastrointestinal endoscopy logistics. Endosc Int Open. 2022 Jan 14;10(1):E56-E61. doi: 10.1055/a-1630-6403.
3. Skogas J, Marvik R. Measures taken to reduce damage and repair costs of rigid endoscopes during their handling and processing in surgical practice. Minim Invasive Ther Allied Technol 2003;12:76-81.
4. Schafer B. Decreased number of repairs of rigid scopes as a result of low-temperature sterilization with H2O2 gas plasma. A field report form the Barmherzige Bruder Hospital in Trier, Germany. Central Serv 2009;17:194-6.
5. Sung J, Springhart W, Marguet C, L'Esperance JO, Tan YH, Albala DM, et al. Location and etiology of flexible and semirigid ureteroscope damage. Urology 2005;66:958-63
6. Canales B, Gleason J, Hicks N, Monga M. An independent analysis of flexible cystoscope repairs and cost. J Urol 2007;178:2098-102.
7. Statham M, Willging JP. Automated high-level disinfection of nonchanneled flexible endoscopes: duty cycles and endoscope repair. Laryngoscope 2010;120:1946-9
Inflation calculator: https://www.bls.gov/data/inflation_calculator.htm Ther Allied Technol 2003;12:76--81.)

Evaluation in your context

When evaluating different sterilization options it is important to think about what factors are relevant to the context.

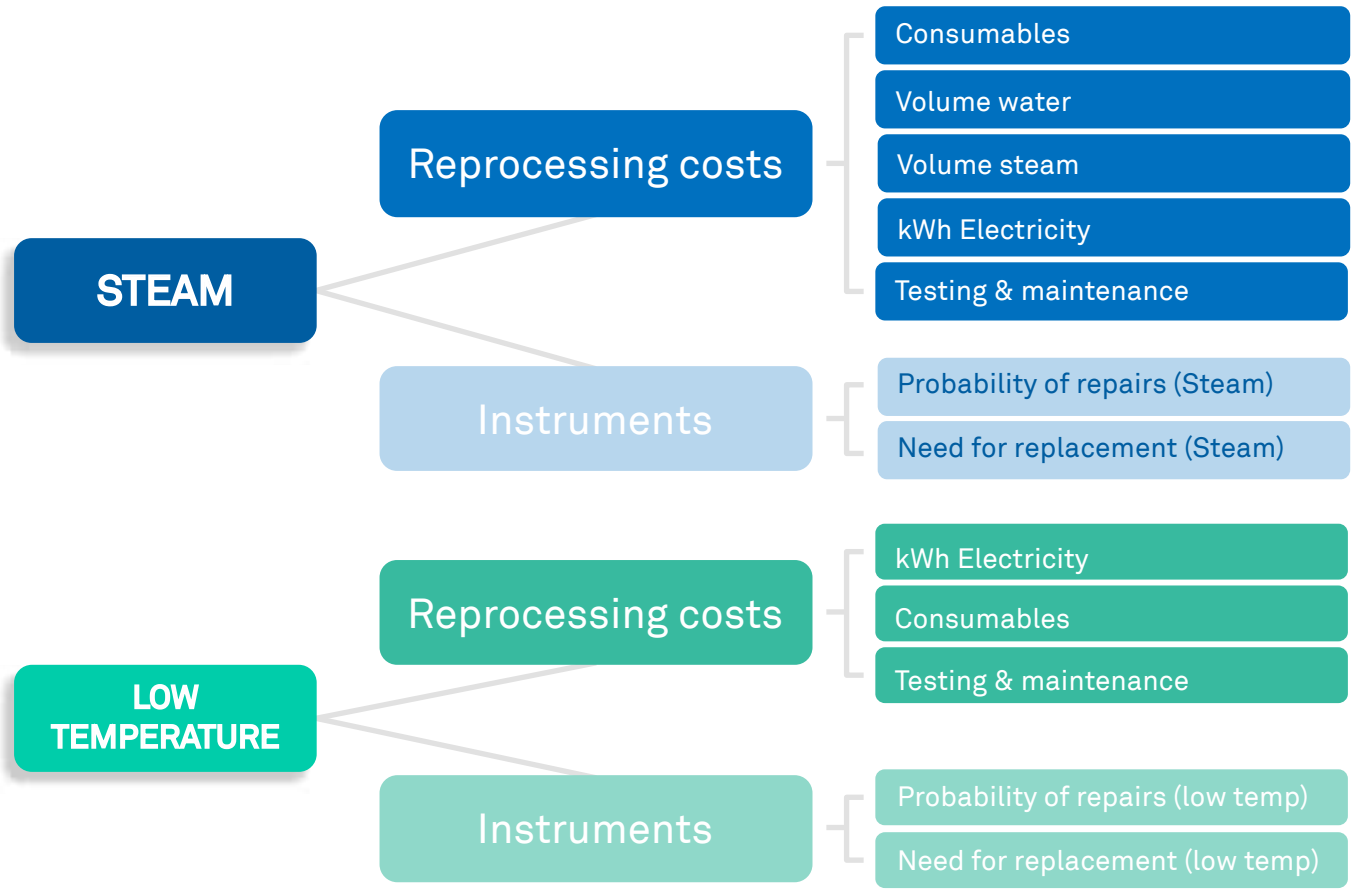
Key context-specific factors

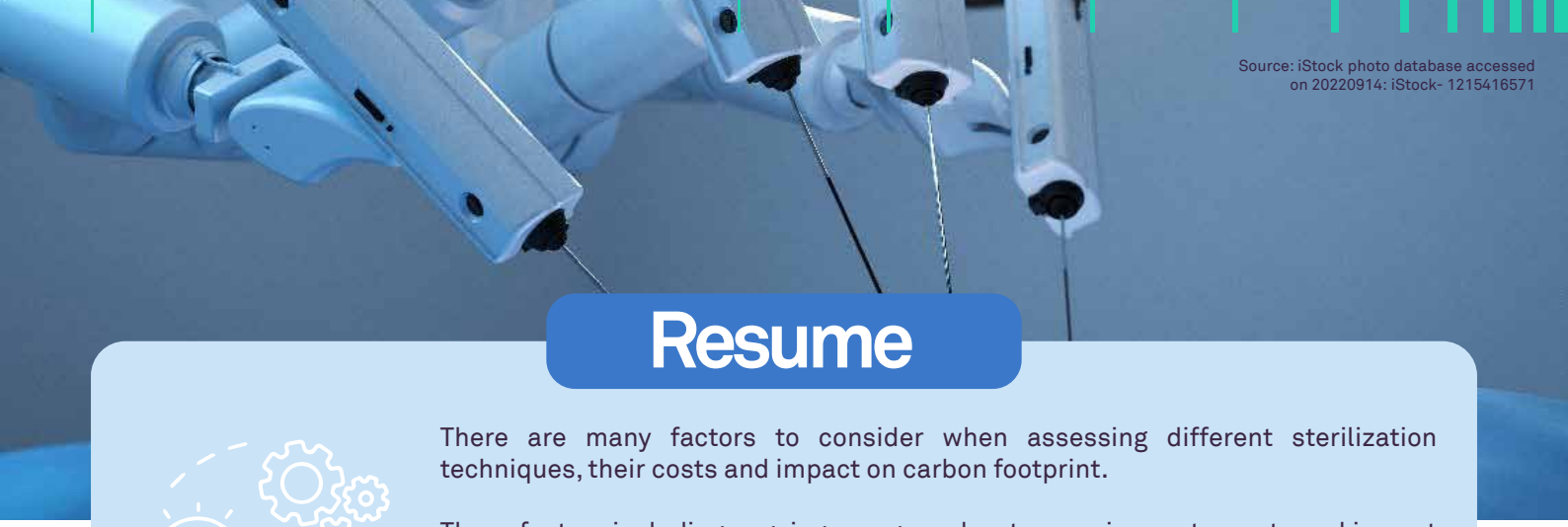
- RELEVANT TIMEFRAME
- INSTRUMENTS USED
- INFLATION – CHANGING COSTS OVER TIME
- BUDGETARY REQUIREMENTS FOR CAPITAL EXPENDITURE V. ONGOING
- LOCAL CONSIDERATIONS – RENEWABLE ENERGY, WASTE DISPOSAL, WATER

EXAMPLE MODEL

OTHER FACTORS MAY BE IMPORTANT IN YOUR CONTEXT

Models can be flexible to different to different inputs and timeframes. They can also be run multiple times with new values, to incorporate uncertainty in estimates of, for example, electricity usage and costs.





Source: iStock photo database accessed on 20220914: iStock- 1215416571

Resume

There are many factors to consider when assessing different sterilization techniques, their costs and impact on carbon footprint.

These factors including ongoing energy and water requirements, costs and impact of consumables, sterilants, testing and maintenance, require greater thought than what might be evident immediately.

The principles used in health economic evaluation can be applied to evaluate different options in different contexts to allow a more holistic decision-making approach and more comprehensive understanding of the environmental impacts and costs of different options.

take home messages

01 Important to look beyond the up-front costs of the sterilizer.

02 There are large differences in energy and water consumption: important in current environment.

03 Effect of different sterilizing processes on instruments important consideration (affects costs and carbon footprint).

04 Consumables/disposable items also contribute to carbon footprint.

05 Principles of health economics can be used to evaluate decisions in your context.

1 (McGain F, Moore G, Black J. Steam sterilisation's energy and water footprint. Aust Health Rev. 2017 Mar;41(1):26-32. doi: 10.1071/AH15142. PMID: 27075773. https://pubmed.ncbi.nlm.nih.gov/27075773/). 2 (McGain F, Moore G, Black J. Hospital steam sterilizer usage: could we switch off to save electricity and water? Journal of Health Services Research & Policy. 2016;21(3):166-171. doi:10.1177/1355819615625698) 3 (ASP: AD-160024-01-CT_C-MDR SteamVsSterrad Energy Water Study_TM_N (Energy) AD-120169-01-CT_A_ISPOR_Sterrad_Poster (Consumables) | https://www.in2013dollars.com/Euro-inflation (inflated prices from ISPOR poster 2014 to 2022), converted to US$ using xe.com) 4 Monthly electricity prices in selected EU countries 2020-2022; Published by Bruna Alves; Aug 23, 2022 5 Skogas J, Marvik R. Measures taken to reduce damage and repair costs of rigid endoscopes during their handling and processing in surgical practice. Minim Invasive Ther Allied Technol 2003;12:76-81. and McCreanor V, Graves N. An economic analysis of the benefits of sterilizing medical instruments in low-temperature systems instead of steam. Am J Infect Control. 2017 Jul 1;45(7):756-760. doi: 10.1016/j.ajic.2017.02.026.

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QUESTIONS & ANSWERS

2022 CME WEBINARS SERIES # 3

3 webinar

THE PURPOSE OF THE WEBINAR WAS TO HAVE **a global overview of economics of circular economy and healthcare**.
WE ADDRESS THE EXAMPLE OF STERILIZATION: STEAM & LOW TEMP - UNCOVERING THE ECONOMICAL MYTH - ANALYZING THE ADVANTAGES ON THE ENERGY AND WATER COSTS, REPAIR COSTS, MD AVAILABILITY AND LONGEVITY WHEN REPROCESSED WITH GENTLE STERILIZATION.

As for the previous webinars, attendees were asked to answer to some polls. Results of the polls:

HOW MUCH DO YOU KNOW ABOUT HEALTH ECONOMICS?

- 55% — I've heard of health economic evaluation, but I don't know much about the details.
- 21% — I know the words "health" and "economics", but not how they work together.
- 21% — I've read about cost-effectiveness analysis, and I know the basics.
- 9% — A lot… I am a health economist!

WHICH STATEMENT DO YOU AGREE MOST WITH?

- 42% — It's a balance. Just because something improves outcomes, doesn't mean we can afford to pay for it.
- 33% — Healthcare today is very expensive so understanding the costs is essential. We can only invest in new technology if it saves costs.
- 25% — Health outcomes are the most important. Costs shouldn't be considered when it comes to people's health.

WHICH FACTORS ARE MOST IMPORTANT TO YOU WHEN THINKING ABOUT THE COSTS OF REPROCESSING MEDICAL DEVICES?

- 35% — Effect on equipment – avoiding need for replacement or repairs
- 30% — Consumable costs
- 22% — Running costs – e.g. energy and water
- 14% — The up-front cost of the sterilizer

WHICH FACTORS ARE MOST IMPORTANT TO YOU WHEN THINKING ABOUT THE CARBON FOOTPRINT OF REPROCESSING MEDICAL DEVICES?

- 22% — Energy consumption in sterilisation/ reprocessing
- 22% — Reducing use of single use items and plastics
- 19% — Water consumption in sterilisation/ reprocessing
- 19% — Chemicals and contamination
- 17% — Effect of sterilisation on medical devices – e.g. damage, frequency of repairs

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Medical Device Reprocessing

2022 CME WEBINARS SERIES # 3

in a Circular Economy - Onsite vs Offsite -

4 webinar

Mrs. May Karam, RN BsN, CNOR

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GOVERNMENTAL CERTIFIED OPERATING ROOM NURSE
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PARIS - FRANCE

intro

THE PURPOSE OF THE CSSD ROLE IS TO GUARANTEE THE DELIVERY OF MEDICAL DEVICES IN A STERILE STATE TO THE OPERATING ROOM AND THE CLINICAL CARE UNITS. THE MEDICAL DEVICES STERILIZED VARY IN COMPLEXITY, FROM SIMPLE KOCHER FORCEPS OR FROBOT OPTICS AND INSTRUMENTS TO ORTHOPEDIC MOTORS, OR FLEXIBLE UROLOGICAL ENDOSCOPES, ETC.

HEALTHCARE FACILITIES CAN CHOOSE TO HAVE AN ON-SITE CSSD OR TO OUTSOURCE THIS SERVICE TO AN EXTERNAL STRUCTURE. THE CHOICE IS NOT SIMPLE BECAUSE MANY FACTORS COME INTO PLAY, WHICH ARE ECONOMIC AND ORGANIZATIONAL. EACH CHOICE HAS ITS ADVANTAGES AND DISADVANTAGES.[1]

MD Reprocessing: its importance for patient safety and how are we proceeding today

Nowadays, all CSSDs are organized everywhere according to the same principle defined by the good practice guidelines, based on the analysis of the needs specific of the healthcare facility to be provided. The activity of a CSSD therefore varies according to the size of the health establishment and its activity. It should be noted that most of the work of the CSSD is provided by the operating rooms.

OLD TIMES Photo: Photo from postcard "Hospital Saint-Joseph – Marseille – sterilization": courtesy Mrs May Karam, France, 2022 | NOWADAYS Photo: Photo: iStock -1127598993

The CSSD has 3 areas: washing area, control and packaging area and sterile output area.
Each of these areas will allow to follow the evolution of a M.D. within the CSSD, making it progress from "contaminated" to "sterile conditioned".[2]
Without the expertise of the CSSD skilled personnel, operating rooms would not be able to function.
This is known as the science of sterilization. Mastery of skills is necessary at all levels of the process to achieve the goals set, the most important of which is patient safety. This means having qualified personnel and regularly updated procedures.[3]
The CSSD responds to the needs of the operating rooms and therefore, the patient. Its organisation is based on the latest Quality Standards of ISO 13485 on the processing of reusable medical devices (RMDs) and maintaining quality system.[4]

> ***In CSSD, mastery of skills is necessary at all levels of the process to achieve the goals set, the most important of which is patient safety. This means having qualified personnel and regularly updated procedures."***

Without the expertise of the CSSD skilled personnel, operating rooms would not be able to function.

On-site sterilization: advantages and disadvantages

In large hospitals, the CSSD is an on-site department. Having an on-site CSSD allows a quick service, less transportation for reprocessed MD. Communication is facilitated between operating rooms and CSSD especially in case of emergencies. Quick and easy responses allow to have less inventory in ORs which is less cost.[1]

At the same time CSSD is also an expensive unit and requires skilled and committed personnel paid by the hospital and a lot of infrastructure like being close to the operating **rooms**, with a large surface area, equipment, clean rooms with air treatment, water treatment, electricity, supplies for cleaning, reprocessing and sterilization. Maintenance and controls by manufacturers and biomedical engineers are necessary but expensive.[5]

On-site CSSD allows to have less inventory in ORs which is less cost and also quick and easy responses between the two teams."

On-site CSSD facilitates communication with ORs and allows a quicker service for the patients.

Photo: AdobeStock_117983737

Off-site sterilization: advantages and disadvantages

Hospitals can choose to outsource this service to an external structure. The choice is not simple neither because many factors come into play, which are economic and organizational. This choice has its advantages and disadvantages.

Off-site CSSD provides the service to healthcare facilities that do not have the necessary space or to allow them to use several square meters efficiently for other departments. Off-site CSSD allows also to optimize costs (equipment, salaries, maintenance, etc.) and reduce idle time by better organization of the activity.

However, this organization also has disadvantages starting with the transport of medical devices which can be expensive and polluting and the cause of delays. This means that the supply to operating rooms will be slower, which will force them to have more MDs on their shelves. The risk of errors during reprocessing trays and the loss of instruments must be considered.[1,5]

Off-site CSSD allows also to optimize costs (equipment, salaries, maintenance, etc.) and reduce idle time by better organization of the activity."

An objective evaluation of the needs is necessary for outsourcing the CSSD activity.

Photo: courtesy from www.aspuniversity.com

Suggestions for the Planet on MD Reprocessing strategies

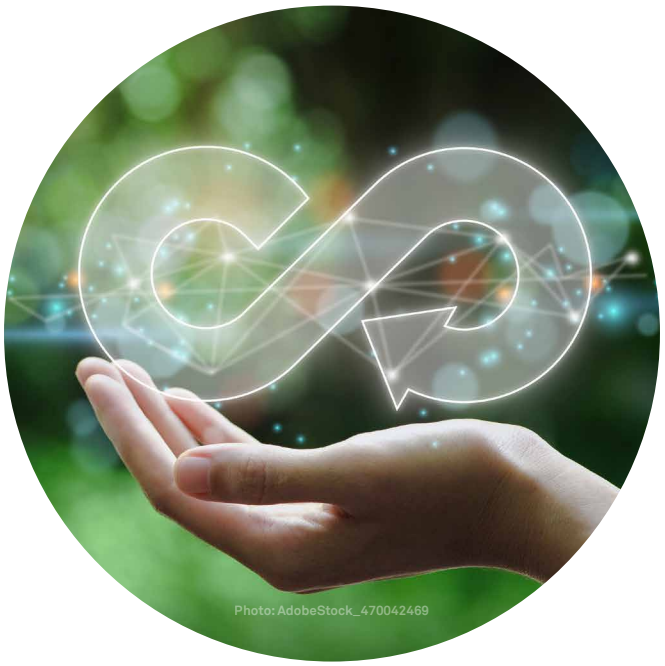
Photo: AdobeStock_470042469

More and more often manufacturers of MD are keen to improve their environmental impact. Their strategies to respect the planet begin with their commitment to ISO 14001 certification[6], which means that they are committed to a sustainable development approach by implementing actions to improve their environmental performance.

Let us be aware that caring of the environment and reducing the CO_2 footprint is not just the concern of technical services and customer services. Each of us who work in CSSD and use the equipment, can participate to reduce the carbon footprint by respecting the instructions for use provided by the manufacturer and the schedule established for maintenance. Two basic details to think about are to avoid using the washers or the sterilizers for just a few MD and to turn off the light, the electric and electronic devices when possible. This helps saving water and electricity.[7]

If the suppliers or the outsourced CSSD are nearby, this therefore makes possible to reduce CO_2 emissions by reducing transports time, either for supplies or for the MD to be reprocessed. This also takes less time, helps to control deadlines while ensuring a quality service.

The repair of CSSD equipment is another example: when possible, having customer service nearby and good support for good maintenance is very helpful. Well-maintained devices have a longer lifespan and optimized performance.

Waste management is essential.[7] In hospitals, we produce millions of tons, hazardous waste, and general, non-hazardous waste. We can recycle to reduce the amount of waste, principle of the circular economy. We do it in our homes trying to reduce waste as much as possible. This is applicable in healthcare facilities and also in the CSSD where there is no hazardous waste. The packaging boxes, the wrapping and the paper/plastic peel packages can be sorted for recycling. Use reusable containers instead of soft wrapping packaging.

Computerized reports help reducing printed documents.

Multiple use MD should be preferred to single use MD. Damaged multiple used MD can be repaired and if not repairable anymore, can be recycled.[8]

Recycled packaging, paper, plastic, and steel can be brought into a high-quality raw material to be manufactured again.[8]

CSSD equipment can be recovered by manufacturers and refurbished and resold.[8]

Let's privilege the quality of MD: a good quality MD or medical equipment is more expensive to buy but last longer.

> ***"It becomes imperative to adapt our methods in the operating room and in the CSSD and to work in a circular economy perspective, to reduce the carbon footprint for the patient, for he health system and to preserve our Planet."***

Caring for the environment, and reducing the CO_2 footprint should be each one's concern wherever we work, especially in healthcare facilities where are produced million of tons of waste.


Photo: Freepik-front-view-plant-growing-from-golden-coins

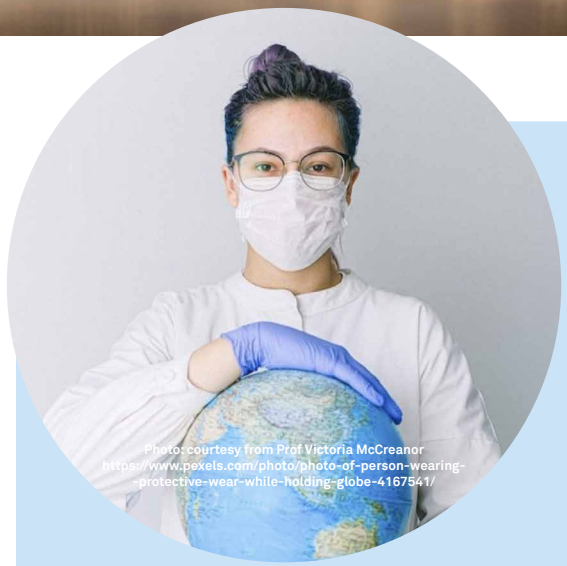
Photo: courtesy from Prof Victoria McCreanor
https://www.pexels.com/photo/photo-of-person-wearing-protective-wear-while-holding-globe-4167541/

Resume

WE HAVE TO BE AWARE OF THE **IMPORTANCE** OF HAVING TO **PRESERVE OUR ENVIRONMENT.**

It becomes imperative to adapt our methods in the operating room and in the CSSD and to work in a circular economy perspective, to reduce the carbon footprint for the patient, for the health system and to preserve our planet.

In general, large hospitals have their own sterilization department. There are also outside facilities that provide this service and work as a sterilization department. Would it be interesting to have a sterilization service onsite, close to the operating room and the health care services, or to outsource this service to facilities far away from the hospital?

The question is not new and both solutions have advantages and disadvantages, because we should consider the economic aspect, the modalities to continue to ensure safe and quality patient care. But let's not forget that the issue is not only about money, organization and the place where the MD reprocessing will be done. Many other factors should be taken into account.

take home messages

01 CSSDs play an important role in patient care, patient safety and infection prevention: Reprocessing of MD is an indirect patient care that must be provided by skilled personnel. It is extremely important to provide a high quality and reliable process by applying validated and up-to-date procedures.

02 On-site CSSD has advantages, especially for large healthcare facilities with a large volume of MD to be processed. The proximity of the CSSD saves time for the MD processing since there are no transportation to consider. However, this entails enormous costs in terms of equipment, materials, personnel and maintenance.

03 Off-site CSSD is less costly for small health care facilities which have less volume of MD to be processed. However, it is important to organize it very carefully, considering all the steps of the process to avoid problems such as reprocessing errors, loss of MD or delays in delivery.

04 In a nutshell, either choice can be beneficial to a healthcare facility. The important thing is to adapt the best solution to the needs, to forget about prejudices and to be objective when taking decisions.

05 The health of the earth is deteriorating. It is becoming urgent to think and to act for a positive change in our way of life and in our workplace. We realize how important it is to "think green" in CSSDs by saving costs, stopping the waste and finding sustainable solutions for reprocessing RMD. Several examples in healthcare, showcase the impact of Circular Economy on this cost reduction (SUD, medical waste, water, energy, etc.). There is also literature and governmental directives (eg. ISO14001) to guide us, but what is important is that each of us becomes an actor in this change.

1 Relocating Sterile Processing Activities to an Off-Site Facility: Cost, Design, and Project Management Considerations April Cardone; Carolyn A. Grous,– AORN Journal, July 2020, Vol. 112, No. 1, pp 30-38 2 Decontamination and Reprocessing of Medical Devices for Health-care Facilities, https://apps.who.int/iris/bitstream/handle/10665/250232/9789241549851-eng.pdf;jsessionid=3D2B2C5446E0235F3AEEE6006D7EBA16?sequence=1 3 SOCIETE FRANCAISE DES SCIENCES DE LA STERILISATION, Guide Bonnes Pratiques de Stérilisation des Dispositifs Médicaux Réutilisables, https://bonnespratiques.sf2s-sterilisation.fr/wp-content/uploads/2021/11/Guide-bonnes-pratiques-07-2021-VD.pdf, access on 20221014 4 ISO13485, https://www.iso.org/obp/ui#iso:std:iso:13485:ed-2:v1:fr; , accessed 20221018 5 Outsourcing or not outsourcing ? stérilisation magazine, page 10 111 # Été 2019 https://www.mobius.eu/app/uploads/Sourcing_STeMag111.pdf , October 2022 6 ISO 14000 Family Environmental Management https://www.iso.org/iso-14001-environmental-management.html October 2022 7 European Association of Hospital Pharmacists (EAHP) - 23-28 March 2021; https://www.eahp.eu/sites/default/-files/1isg-027_1.pdf 8 A Circular Healthcare Economy; a feasibility study to reduce surgical stainless-steel waste HYPERLINK "https://www.sciencedirect.com/science/article/pii/S2352550920313701#!"B.van HYPERLINK "https://www.sciencedirect.com/science/article/pii/S2352550920313701#!" HYPERLINK "https://www.sciencedirect.com/science/article/pii/S2352550920313701#!"Straten & al. HYPERLINK "https://www.sciencedirect.com/journal/sustainable-production-and-consumption"Sustainable Production and Consumption Journal, HYPERLINK "https://www.sciencedirect.com/journal/sustainable-production-and-consumption/vol/27/suppl/C"Volume 27, July 2021, Pages 169-175, https://www.sciencedirect.com/science/article/pii/S2352550920313701

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2022 CME WEBINARS SERIES # 3

4 webinar

THE PURPOSE OF THE WEBINAR WAS TO SHOW A GENERAL OVERVIEW ON

the advantages and disadvantages of each MD Reprocessing modalities

(- ON-SITE VS OFF-SITE AND WHAT TO TAKE INTO ACCOUNT IN EACH OF THEM.

As for the previous webinars, attendees were asked to answer to some polls. Results of the polls:

WHICH DEPARTMENT DO YOU BELIEVE IS MORE CRITICAL FOR THE MD REPROCESSING?

- 37% Operating Room
- 37% Central Sterile Services Department
- 25% Infection Prevention & Control
- 0% Pharmacy

IN YOUR HOSPITAL, WHICH MODEL OF MD REPROCESSING DO YOU HAVE?

- 7% Off-site CSSD
- 93% On-site CSSD

WHICH DO YOU BELIVE ARE THE DISAVANTAGES OF THE OFF-SITE CSSD?

- 29% Transportation
- 25% Time
- 18% MD damages/loss
- 15% Costs
- 12% Additional volume MD

IN WHAT AREAS IS YOUR INSTITUTION CURRENTLY INVESTING FOR THE CIRCULAR ECONOMY?

- 25% Electricity savings
- 25% Reduction of waste disposable (supplies)
- 21% Reduce SUD (use RMD)
- 18% Reduce packaging materials (use containers)
- 11% Water savings

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Health Technology Assessment in the Circular Economy of Medical Devices

webinar 5

Eng. Jonathan Hart

HEAD OF TECHNOLOGICAL INNOVATION AND HEALTH TECHNOLOGY ASSESSMENT
POLICLINIC UNIVERSITARIO CAMPUS BIO-MEDICO
ROME - ITALY

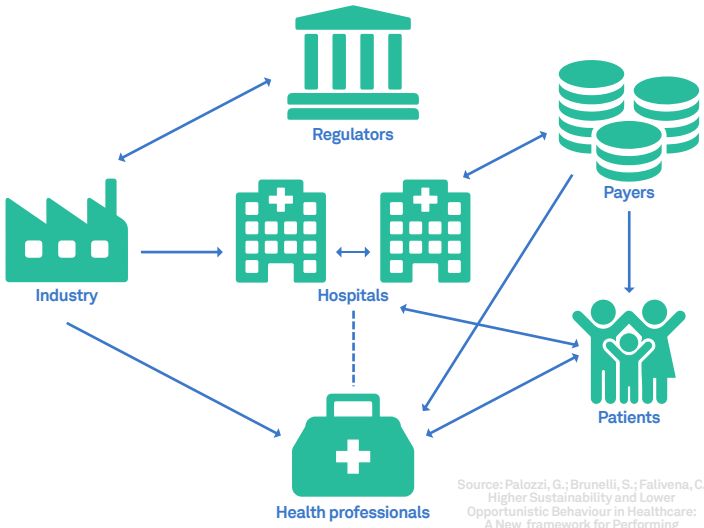
2022 CMF WEBINARS SERIES # 3

intro

AS WASTE MANAGEMENT, POLLUTION AND CLIMATE CHANGE ARE GLOBAL ISSUES AT ALL LEVELS, CIRCULAR ECONOMY IS, FOR ALL SECTORS INCLUDING HEALTHCARE, A NECESSARY SOLUTION AND AN OPPORTUNITY FOR SUSTAINABILITY. THE SUCCESS OF CIRCULAR ECONOMY MODELS IN HEALTHCARE REQUIRES, IN ORDER TO BE DEVELOPED AND ADOPTED, A JOINT EFFORT ON THE PART OF INDUSTRY, POLICY MAKERS AND USERS.

Role of Health Technology Assessment (HTA) in healthcare circular economy

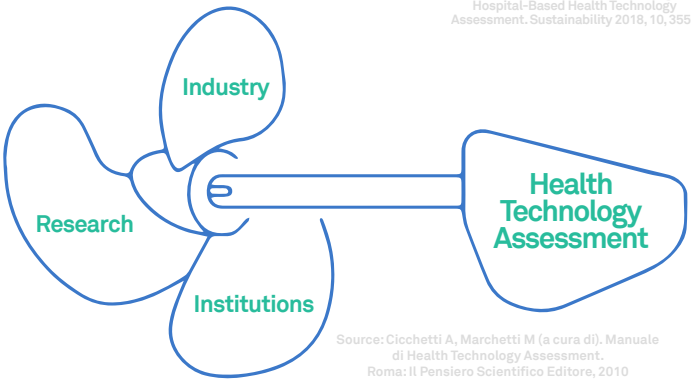
HTA is a multidimensional evidence based approach for investigating the effects of a technology (not only drugs, devices or equipment, but also procedures and organizational interventions)[1,2,3], it is therefore a comprehensive tool in evaluations relative to circular economy in healthcare. HTA can guide institutions, industry and research[4] in the adoption of circular economy solutions by providing evidence on the impact compared to current practices.



Source: Palozzi, G.; Brunelli, S.; Falivena, C. Higher Sustainability and Lower Opportunistic Behaviour in Healthcare: A New framework for Performing Hospital-Based Health Technology Assessment. Sustainability 2018, 10, 3550

> *"HTA can guide institutions, industry and research in the adoption of circular economy solutions."*

HTA is a tool for making evidence based decisions.



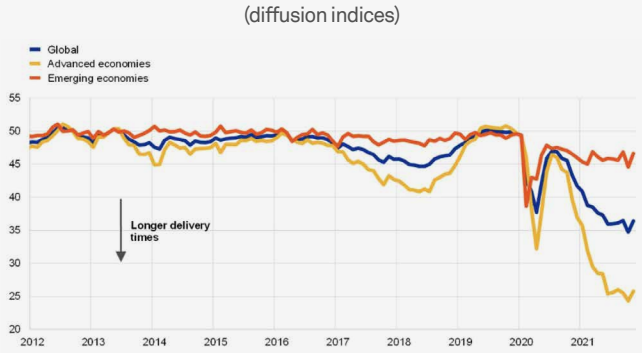
Source: Cicchetti A, Marchetti M (a cura di). Manuale di Health Technology Assessment. Roma: Il Pensiero Scientifico Editore, 2010

Context: supply chain and service requirements

Supply chains in all markets are suffering stock outages and back orders due raw material scarcity and demand exceeding availability[5,6,7]; all these factors are exacerbated by current geopolitical conditions. The growing imbalance between demand and availability of raw materials is causing supply chain disruptions are to be avoided in healthcare. The management of material resources in healthcare according to circular economy models is crucial not only for its economic and environmental sustainability but also in order to deliver diagnostic and therapeutic services.

Suppliers' delivery times

a) PMI SDT across regions

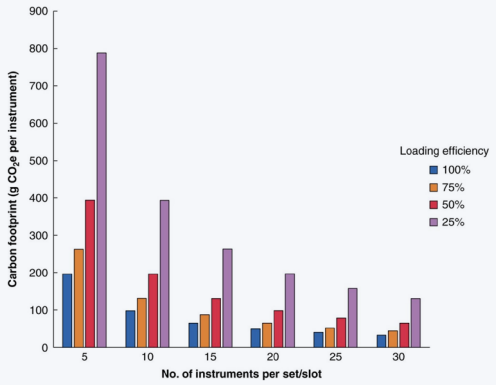


Source: https://www.ecb.europa.eu/pub/economic-bulletin/focus/2022/html/ecb.ebbox202108_01~e8ceebe51f.en.html

> *The growing imbalance between demand and availability of raw materials is causing supply chain disruptions are to be avoided in healthcare."*

Circular economy business models are essential for the upkeep of supply chains.

Carbon footprint of decontaminating instruments under different loading scenarios.



Source: 21. C Rizan, R Lillywhite, M Reed, MF Bhutta, Minimising carbon and financial costs of steam sterilisation and packaging of reusable surgical instruments, British Journal of Surgery, Volume 109, Issue 2, February 2022

Stakeholder involvement: priority setting and balancing

In healthcare the application of circular economy principles such as reuse, reduce and recycle must be carefully assessed and applied to changes in practices in order to maintain current standards in patient safety and outcomes. Just as in the general population, awareness of environmental issues is growing among healthcare professionals; there is growing attention to CO_2 emissions and waste management associated to clinical activity[8,9,10]. The advance of circular economy should be driven by all stakeholders: from the institutions, policy makers, organizations and single professionals.

Circular economy models must ensure adequate clinical standards and outcomes."

The change toward circular economy needs to be promoted both top-down and bottom-up.

single use vs reusable

Image: https://www.freepik.com/free-photo/digital-screen-with-environment-day_12976397.htm#query=reusable&position=4&from_view=search&track=sph

WHICH AND HOW TO CHOOSE?

The carbon footprint of medical activity is determined by the choice between single use and reusable devices[11, 12]; the selection must take into account every aspect of their employment (logistic[15], ecological, organizational, clinical). The most appropriate type of device to be employed depends on management and setting: staffing, activity volumes, distances, structures and infrastructures. In the case of surgical or endoscopic instruments, reprocessing method selection[14] and planning also play an important role: their optimization[13, 14] (equipment loading, set composition) can sensibly reduce emissions and costs.

Organizational variables are always key in the choice of reusable vs. single use.

The most appropriate type of device to be employed depends on management and setting."

Image: iStock photo database accessed on 20220914: iStock-1298626492

Resume

HTA allows a comprehensive and evidence based approach to circular economy applications in healthcare, it can help appraise whether devices or solutions that are proven environmentally sustainable are also clinically effective and acceptable.

It is important to assess how circular economy models (with smaller CO_2 footprints) compare to current practice in terms of clinical outcomes and effectiveness, as well as efficiency and organizational factors. Life cycle analyses and economic evaluations alone do not provide conclusive evidence to decision makers.

Due to supply chain disruptions, increase in energy costs and raw material shortages circular economy is becoming not only the goal in new business models but also the means to achieve economic sustainability and meet service requirements.

take home messages

01 HTA is a multidimensional approach for supporting evidence-based decisions in the application of circular economy solutions.

02 Circularity is to be practiced in healthcare for environmental and economic sustainability but it also a necessity in order to prevent supply chain disruptions in a scenario of growing imbalance between demand and availability of material resources.

03 Life cycle analyses and carbon footprint calculations should always be accompanied by the assessment of outcomes in order to ensure adequate clinical standards.

04 The choice of reusable vs. single-use devices depends on many direct and indirect variables but operations elements may result in being decisive.

1. EuNetHTA Core Model, https://www.eunethta.eu/hta-core-model/ 2.The International Network of Agencies for Health Technology Assessment (INAHTA), 2014, https://www.inahta.org/ 3. O'Rourke B, Oortwijn W, Schuller T, the International Joint Task Group (2020). The new definition of health technology assessment 4. Cicchetti A, Marchetti M (a cura di). Manuale di Health Technology Assessment. Roma: Il Pensiero Scientifico Editore, 2010 5. P. Lacy, J Keeble, R McNamara et al. - Circular Advantage, Innovative Business Models to Create Value in a World without Limits to Growth - Accenture Strategy, 2014 6. https://www.ecb.europa.eu/pub/economic-bulletin/focus/2022/html/ecb.ebbox202108_01~e8ceebe51f.en.html 7. https://www.statista.com/chart/25960/supply-chain-disruption-index/ 8. K Siau, B Hayee, S Gayam,Endoscopy's Current Carbon Footprint, Techniques and Innovations in Gastrointestinal Endoscopy, Volume 23, Issue 4, 2021 9. R Haddock; R de Latour,; K Siau, Keith; B Hayee,; S Gayam, Swapna. Climate Change and Gastroenterology: Planetary Primum Non Nocere and How Industry Must Help. The American Journal of Gastroenterology: March 2022 - Volume 117 - Issue 3 10. https://www.statista.com/chart/25960/supply-chain-disruption-index/ 11. LV Hernandez, N Nhat Thu Le, C Patnode, O Siddiqui, O Jolliet. Comparing The Impact Of Reusable And Single-use Duodenoscopes Using Life Cycle Assessment - Clinical Endoscopic Practice 1: Lecture| Volume 93, Issue 6, Supplement , Ab29, June 01, 2021 12. A Burguburu et al. - Comparative life cycle assessment of reusable and disposable scrub suits used in hospital operating rooms - Cleaner Environmental Systems, Volume 4, March 2022, 100068 13. C Rizan, R Lillywhite, M Reed, MF Bhutta, Minimising carbon and financial costs of steam sterilisation and packaging of reusable surgical instruments, British Journal of Surgery, Volume 109, Issue 2, February 2022 14. C Rizan, T Brophy, R Lillywhite, M Reed, MF Bhutta - Life cycle assessment and life cycle cost of repairing surgical scissors - The International Journal of Life Cycle Assessment (2022) 27:780–795 15. Relocating Sterile Processing Activities to an Off-Site Facility: Cost, Design, and Project Management Considerations April Cardone; Carolyn A. Grous,– AORN Journal, July 2020, Vol. 112, No. 1, pp 30-38

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QUESTIONS & ANSWERS

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5 webinar

THE PURPOSE OF THE WEBINAR WAS TO UNDERSTAND THE **role of HTA on Circular Economy** AND WHAT SHOULD BE CONSIDER ON THE ON THE MD REPROCESSING DECISIONS AND TECHNOLOGIES/SOLUTIONS SELECTION (INSTRUMENTS SETS, EQUIPMENT, TRANSPORTATION, MONITORING, TRACEABILITY, ETC.)

As for the previous webinars, attendees were asked to answer to some polls. Results of the polls:

HOW CAN HTA CONTRIBUTE TO HEALTHCARE CIRCULAR ECONOMY?

- 44% Patient safety
- 22% Economic sustainability
- 17% Making evidence-based decisions
- 17% Environmental sustainability

WHY IS CIRCULAR ECONOMY NECESSARY IN THE HEALTHCARE INDUSTRY?

- 47% Economic sustainability
- 42% Environmental sustainability
- 11% To meet service requirements

IN THE ADOPTION OF CIRCULAR ECONOMY SOLUTIONS IN HEALTHCARE, WHAT COUNTS MOST?

- 48% Maintaining clinical standards
- 24% CO_2 emissions
- 19% Waste produced
- 10% Cost of energy

WHICH ORGANIZATIONAL ASPECT IS MORE IMPORTANT IN THE MANAGEMENT OF REUSABLE MEDICAL DEVICES?

- 48% Adoption of reusable vs. single use instruments
- 24% High vs. low temperature technologies
- 19% Set optimization and sizing
- 10% Onsite vs. offsite reprocessing

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Circular Economy
on MD Reprocessing
a roadmap for new solutions

webinar 6

MODERATOR
Dr. Carlos Palos
INFECTION CONTROL & ANTIMICROBIALS RESISTANCE NATIONAL COORDINATOR
LISBON - PORTUGAL

2022 CME WEBINARS SERIES #3

"

AS THE SCIENTIFIC DIRECTOR OF THE WEBINAR SERIES **"CIRCULAR ECONOMY IN MEDICAL DEVICES REPROCESSING: A ROADMAP FOR NEW SOLUTIONS"**, I WANT TO EXPRESS AGAIN MY GRATITUDE TO ASP FOR BEING SO COMMITTED WITH SAFETY AND QUALITY OF CARE, IN PARTICULAR WITH THIS CHALLENGING SUBJECT.

I WANT ALSO TO THANK ALL MY COLLEAGUE SPEAKERS THAT ENTHUSIASTICALLY ANSWERED TO THE CALL, DESPITE THEIR TIME CONSTRAINTS AND FINALLY, TO ALL THE ATTENDEES THAT ACTIVELY PARTICIPATED IN THE WEBINARS.

DR. CARLOS PALOS
Grupo Luz Saúde,
Lisbon Infection Control & Antimicrobials Resistance National Coordinator & Scientific Director for this ASP SUMMIT CME Webinar 3rd Series

The **6th webinar** took place on January 2023, counting with all the speakers.

DR. CARLOS PALOS

Conclusion

THE HEALTHCARE SECTOR IS A MAJOR CONTRIBUTOR TO THE CLIMATE CRISIS.

The adoption of circular economy strategies (minimizing resource use and extraction, using resources for longer and extending product life, optimising resource recovery, implementing ecosystem stewardship, and creating economic and social value equitably) has benefits on the environment, individual and public health, economy and maintenance of supply chains.

Several barriers to the adoption of circular economy do exist, such as challenges associated with reverse logistics, concerns over safety and perceptions regarding infection prevention, behaviours of device customers and manufacturers, and regulatory structures that encourage the proliferation of single use (disposable) medical devices.

Health Technology Assessment in healthcare, including Life Cycle Assessments, environmental impact per unit of functionality/service, or the adoption of metrics and scores, such as circularity metrics, toxicity hazard scores and repairability and durability scores, contributes to bypass barriers to the adoption of a circular economy strategy.

From producers to end-users, all healthcare players can contribute to implement circular economy strategies in this field towards a greener World."

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