

# Stepping up to the sustainability challenge in healthcare

Healthcare professionals around the world are looking for new ways to make their activities and the medical service they provide more sustainable and environmentally friendly. As the climate challenge comes into ever sharper focus, everyone from hospital managers, to physicians, to nurses, to logistic staff and procurement officers are endeavoring to do their part to improve sustainability and environmental performance in the healthcare sector.

This new orientation comes in response to a general recognition that the healthcare sector as a whole will have an important role to play in making progress with a broad range of environmental issues – including waste reduction, resource conservation and carbon emissions. A 2019 report estimated, for example, that if the global health care sector were considered as a country, it would be the world's fifth largest emitter of greenhouse gases.<sup>1</sup>

Of course, the current high level of energy and resource use in healthcare is being applied for an essential purpose, namely curing disease and saving human life. But there is a growing consensus in the industry that this all-important healthcare mission has sometimes diverted attention from the possibility of more responsible and sustainable use of resources in various healthcare applications.

## What can be done?

Now a clear shift is underway, and healthcare actors around the world are taking action to adopt more sustainable practices. This reorientation makes sense particularly in light of the fact that the effects of climate change are currently emerging as one of the leading public health issues of the 21st century.<sup>2</sup>

In hospitals around the world the question is being asked:  
**How can we continue to provide existing levels of care, while at the same time lowering the environmental impact involved in fulfilling healthcare needs?**

Given the scope and the complexity of the healthcare industry, the move towards change is naturally multi-faceted and highly diverse.

A cover story in the American Hospital Association's journal Health Facilities Management identifies three key areas – energy use, waste reduction and supply chain management – in which more and more hospitals are taking their first steps, and in the process achieving "real progress through effective, efficient and often cost-effective sustainability measures"<sup>3</sup>:

## Focus on waste reduction

Obviously, initiatives in all three of these areas are important and, indeed, essential in order to make real sustainability progress. For waste reduction, one simple approach is to look for ways to reduce disposable materials inputs in hospital activities so as to reduce overall waste outputs. It can be effectively applied in a variety of hospital departments, ranging from food service to sanitary supplies to the central processing of sterile goods.

The challenge with waste reduction initiatives is to maintain (or even improve) current levels of healthcare service, while at the same time reducing the quantity of materials that are used in connection with that service. Of course, providing medical care in the hospital inevitably involves the use of materials and thus the generation of waste. The basic question which healthcare managers are now posing across a wide range of areas is simply this:

**Are these materials essential to the specific purpose or not?**

And if there is an alternative method involving a lower use of materials and thus a lower generation of waste:

**Is the low-material method practical, well-proven and also cost-efficient?**

1 <https://noharm-global.org/documents/health-care-climate-footprint-report>

2 <https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health#:~:text=Climate%20change%20affects%20the%20social,malaria%2C%20diarrhoea%20and%20heat%20stress.>

3 <https://www.hfmmagazine.com/articles/4274-hospitals-reduce-their-carbon-footprints-with-sustainable-solutions#:~:text=The%20global%20health%20care%20industry,514%20coal%20fired%20power%20plants>

**A case in point: Processing sterile goods for re-use in the OR**

There are two well-established packaging methods employed in hospitals to handle instruments during the sterilization of reusable medical equipment for further use in the operating room – single-use sterilization wraps and reusable rigid sterile containers. With both methods, instruments and equipment are placed in an autoclave for steam sterilization. The methods differ in how the instruments are prepared for the autoclave sterilization step.

With the single-use wrap method, instruments are typically wrapped in two layers of polypropylene woven plastic before being placed in the autoclave for sterilization. The wrap serves as a single-use sterile packaging for the instruments and equipment that are being sterilized; the instruments are removed from the wrapping in preparation for the next operation and the plastic material is either disposed of or – in some cases – recycled.

With the rigid sterile container (RSC) method, the instruments are placed without any additional wrapping in a reusable sterile container before going into the autoclave. They remain inside this container until being removed and made ready for an upcoming operation.

**Waste generation: RSCs vs single-use sterilization wrap**

**Single-use wrap:** In a typical mid-sized hospital in Germany where 10,610 annual surgeries are performed with an average of 3 sterilization sets per surgery, **3,310 kg of polypropylene plastic waste** is generated when blue wrap is used for OR instrument sterilization.

**Rigid sterile containers:** With the same number of surgeries and sets using RSCs, a total of just **149 kg of waste is produced (103 kg cellulose, 46 kg polypropylene)** from paper filters and locks used in conjunction with the containers.

# WASTE QUANTITY COMPARISON

Sterilization with blue wrap vs AESCULAP® rigid sterile containers

Sterilization using

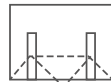
## SINGLE-USE PLASTIC WRAP (BLUE WRAP)



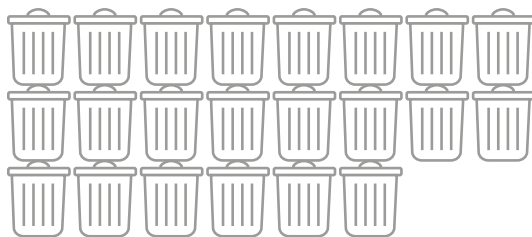
Typical mid-sized German hospital



10,610 annual surgeries, 3 sterilization sets per surgery



Per sterilization set: 52 grams (2 single-use wraps)



**3,310 kg**

polypropylene waste per year

Sterilization using

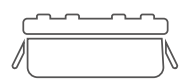
## AESCULAP® RIGID STERILE CONTAINERS



Typical mid-sized German hospital



10,610 annual surgeries, 3 sterilization sets per surgery



Per sterilization set: 4.7 grams (paper filters and locks)



**149 kg**

total waste per year (103 kg cellulose, 46 kg polypropylene)

## BOTTOM LINE:

**AESCULAP® rigid sterile containers result in 95% less waste** than blue wrap.

Single-use wrap thus results in 22 times more waste generation – with corresponding effects on carbon emissions in the case of incineration or landfill for physical disposal, as well as additional costs related to waste handling. Downcycling of the sterilization wrap for other non-medical polypropylene applications is theoretically possible but it presents substantial logistical challenges and is not widely used in practice.

The negative sustainability profile of single-use sterilization wrap in respect to waste generation is indisputable. For hospitals aiming to reduce the amount of waste coming out of their ORs on an ongoing basis, rigid sterile containers offer decisive advantages.

#### Performance and costs: RSCs vs single-use wrap

In modifying hospital practices to become more sustainable, it is also important to look at the level of care and the costs of alternative approaches associated with better sustainability characteristics.

So what about the quality of care and the costs associated with the use of these two methods?

#### Performance

**Single-use wrap:** As a disposable packaging, single-use wrap would seem to provide sufficient sterile protection for instruments. This is the case – except when perforations or tears occur in the wrap and disrupt the sterile barrier that it should be providing. When this happens and the holes in the wrap are detected, it is necessary to re-sterilize the affected instruments, which can result in last-minute disruptions of planned surgeries.

**RSCs:** As a standard handling step, rigid sterile containers will be visually inspected before each use, but they typically provide robust service over thousands of sterilization cycles. Ongoing problems with the maintenance of sterile barriers are not an issue.

#### Costs

The initial investment in rigid sterile containers is substantial. At the time of first use, single-use wrap thus offers a distinctive cost advantage to RSCs. But because the wrap is disposable, it must be purchased on an ongoing basis which creates ongoing costs that do not occur with the continuing use of RSCs. In addition, arrangements must be made for its disposal or recycling, which also generate costs.

In a US-based calculation, it has been estimated that a conversion to rigid sterile containers can save a medium size hospital up to \$20K annually in disposable operating expenses and more than 150 hours in processing time.<sup>4</sup> Similarly, a Germany-based study found that use of a sterilization container without an inner wrap was the most cost-effective option for processing of sterile equipment – with a per-use cost of €2.05 set sterilization as compared to €3.87 per set sterilization for two layers of single-use sterilization wrap.<sup>5</sup>

#### Making real sustainability progress

Reducing the amount of waste generated in hospitals is challenging because many single-use products that contribute to the total quantity of waste produced do, in fact, provide essential healthcare benefits that cannot be achieved with reusable alternatives.

In this context, the possibility of eliminating thousands of kilograms of plastic waste at an average hospital each year, while actually improving performance in an important field of hospital operations offers a highly attractive option for healthcare managers aiming to improve sustainability performance.

That is the opportunity available in connection with a switch-over from single-use wrap to rigid sterile containers for autoclave sterilization of OR equipment and instruments.

It is estimated that alone in the USA, 115 million kilograms of such single-use wrap are used and thrown away each year.<sup>6</sup>

4 Figure from Aesculap website. Referenced: "Data on file at Aesculap"

5 Krohn, M.; Fengler, J.; Mickley, T.; Flessa, S. Analysis of processes and costs of alternative packaging options of sterile goods in hospitals—A case study in two German hospitals. *Health Econ. Rev.* 2019, 9, 1. <https://doi.org/10.1186/s13561-018-0218-2>

6 Bodkin, Christopher. "Blue Wrap and the Circular Economy". Published in the Greenbeat Blog, 11.01.2018. <https://practicegreenhealth.org/about/news/blue-wrap-and-circular-economy>

While it certainly makes sense to try to recycle such waste more effectively, not generating it at all has even more environmental benefits. And the low-waste generation course of action available with rigid sterile containers delivers both excellent performance and lower long-term costs – while at the same time eliminating a significant source of unnecessary plastic use.

It is against this background that the authors of a recent study comparing the environmental impact of single-use wrap and rigid sterile containers conclude: "Doctors should be conscious of how encultured disposables like blue wrap have

become in healthcare. Often, unrealistic expectations regarding infection prevention, perceived price benefit, and ease of use underlie the choice for disposables. We need to be more informed of the destructive effects of our disposables on the environment and demonstrate which alternatives exist on the basis of LCA-driven (life cycle assessment) scientific research."<sup>7</sup>

Finally, using rigid sterile containers instead of blue wrap for the sterilization of OR equipment offers an important and substantial quick win for healthcare facilities that are aiming to do something important for waste reduction.

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7 Friedericy, H.J.; van Egmond, C.W.; Vogtländer, J.G.; van der Eijk, A.C.; Jansen, F.W. „Reducing the Environmental Impact of Sterilization Packaging for Surgical Instruments in the Operating Room: A Comparative Life Cycle Assessment of Disposable versus Reusable Systems". Sustainability 2022, 14, 430. <https://doi.org/10.3390/su14010430>, p. 13

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