

# Can a Rigid Container System be Greener and Safer at the Same Time?

— Unique rigid container benefits healthcare “greening” efforts

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## Introduction

Providing optimal safety for patients is a major responsibility of any healthcare provider. One of the highest priorities should be to promote patient safety by tackling problems and finding solutions to known issues. In today’s healthcare environment, infection prevention plays a huge role in national initiatives to reduce healthcare-acquired infections (HAI). This is particularly important for perioperative professionals in regard to surgical site infections (SSI).

One critical way to minimize risks to surgical patients is to present items that are sterile (free of contamination) at the time of use. It is imperative that sterilization packaging systems ensure the integrity of the sterilized contents until opened for use. The material or packaging device used for

items to be sterilized should provide a microbial barrier, protect package integrity, provide adequate seal integrity, allow for aseptic presentation, and reduce the chance of contamination of the contents once sterilized.<sup>1</sup>

## Shelf Life

It has been proven that sterility does not change over time, but is compromised by events that harm the integrity of the package and/or the environmental conditions. We refer to the time that an item may remain on the shelf and still maintain sterility as shelf life.<sup>1,2,3</sup>

The integrity of sterile packaging can be compromised from many things such as poor package quality, improper storage conditions and excessive and/or abusive handling.<sup>2</sup>

Events that may lead to decreased package integrity and therefore loss of sterility include:

- ▶ multiple handling,
- ▶ moisture penetration,
- ▶ exposure to environmental contaminants,
- ▶ uncontrolled/unclean storage conditions, and
- ▶ improper type or configuration of packaging materials used.<sup>2</sup>

## Handling Sterile Supplies

After surgical instruments are sterilized and cooled it is extremely important that they are handled carefully to maintain sterility. “Care should be taken to avoid dragging, sliding, crushing, bending, compressing, or puncturing the packaging or otherwise compromising the sterility of the contents.”<sup>3</sup>

Sterile packages or trays must be handled several times



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when they are placed on and pulled off storage shelves, placed on and off case carts, and then again when in the procedure area or operating room. Due to the fast-paced environment of the operating room, packages are not always handled with the greatest of care and are sometimes inadvertently subject to abuse (i.e. dropping). Therefore, we must place an increased importance on the hygienic security of sterilization packaging.

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### Package Choices

There are many available choices for sterilization packaging on the market today. A popular choice for numerous reasons is reusable rigid sterilization containers. These containers serve as packaging for surgical instruments before, during and after sterilization. Sterilization container systems have been on the market for more than 25 years and vary in design, mechanics and construction materials. Reusable rigid sterilization containers require a barrier system (e.g. filters or valves) to maintain package integrity.<sup>4</sup>

Rigid container systems protect instruments, contain sets, and help to eliminate the chance of package compression, tears or holes that may be associated with other types of packaging resulting in compromised package integrity.

Reusable containers are an environmentally friendly alternative to disposable packaging. In the push for healthcare facilities to become more “Green,” reusable containers offer an opportunity to reduce the carbon footprint left behind by healthcare.

A very unique rigid container on the market is the Steriset container system manufactured in Germany by Wagner and distributed by Medline.<sup>5</sup>

Steriset does not require any disposable filters or locks which is an added benefit for our healthcare greening efforts.

According to the *Sterilization Container Overview & Technical Data sheet*, Steriset containers are comprised of a completely closed double lid protection system that is exceptionally tamper proof and hygienically secure. The containers are designed with a permanent reusable stainless steel valve which opens/closes to allow steam to enter/exit based on the steam pressure during the sterilization cycle. The containers are also equipped with reusable tamper proof locks that are temperature activated.<sup>6</sup>

### Environmentally Responsible

With the national initiatives to reduce HAIs, healthcare professionals’ major concern is patient safety such that perioperative professionals must do everything they can to help decrease the chances of SSI. Sterilization containers in themselves are much more environmentally friendly than sterilization wrap; however, eliminating the use of disposable filters or locks as well makes Steriset containers the “greenest” container of them all, thereby best meeting the need for both patient safety and environmental responsibility.



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These environmentally friendly containers are a better alternative to those requiring disposable items, but do they offer any additional protection?

The container’s double lid is designed to provide complete hygienic security, therefore adding an additional shield from any external contaminants once sterilized. Further, with its permanent filter and lock features, Steriset requires much less assembly time and significantly reduces the possibility of user error during packaging which can only benefit patient safety.

Does this design really help protect the contents against external contaminants while in storage? To validate the complete hygienic security provided by Steriset against disposable filters, an independent lab study was conducted by Q Laboratories Inc. in Cincinnati.

**Study Purpose**

The purpose of this study was to compare Steriset container system with two other rigid container systems currently on the market which use disposable filters and locks. The principle idea was to evaluate the ability of each container to protect the contents from environmental contaminants.<sup>7</sup>

**Study Design and Methodology**

A Methylene Blue strike-through test was employed to evaluate the rigid containers. In this analysis, tests were performed on empty containers. Two containers included the manufacturer recommended filter material assembled in the perforated lids and bottoms of the containers. The Steriset containers do not contain any filters. A single sheet of wet Kleenex was placed over the bottom filters on the inside of the two containers. A wet Kleenex was placed on the bottom of the Steriset container. After the lids were closed and latched, one teaspoon of Methylene Blue dust was sprinkled on top of each of the three containers.<sup>8</sup>

Each container was dropped three times onto a hard table surface from a height of 10 cm (3.9 inches). Following the drop test, each container was placed into a closed cabinet and the door closed at normal force five times. Then the three types of container were again dropped three times onto a hard table surface from a height of 10 cm (3.9 inches). The lids were then carefully opened to observe for any strike-through of the Methylene Blue on the wet Kleenex inside of each container. In order to evaluate the degree of strikethrough present, the lids and filters were sprayed with distilled water. To obtain a thorough set of qualitative data, this entire procedure was replicated 10 times on each container. After each test, photos of the filters and moistened Kleenex were taken for a visual comparison.<sup>8</sup>

**Table 1. Test results**

	<b>Container No. 1</b> (with disposable filter)	<b>Container No. 2</b> (with disposable filter)	<b>Steriset container</b> (no filters)
<b>Did the Methylene Blue dust strike through the filters?</b>			
<b>Trial No. 1</b>	Yes	Yes	No
<b>Trial No. 2</b>	Yes	Yes	No
<b>Trial No. 3</b>	Yes	Yes	No
<b>Trial No. 4</b>	Yes	Yes	No
<b>Trial No. 5</b>	Yes	Yes	No
<b>Trial No. 6</b>	Yes	Yes	No
<b>Trial No. 7</b>	Yes	Yes	No
<b>Trial No. 8</b>	Yes	Yes	No
<b>Trial No. 9</b>	Yes	Yes	No
<b>Trial No. 10</b>	Yes	Yes	No
<b>Total number of strike-throughs</b>	10	10	0

## Results of Study

The study results indicate that none of the Wagner Steriset containers had any Methylene Blue strikethrough residue present. The other two rigid sterilization containers had strikethrough residue present at the conclusion of all 10 trials tested. (See Table 1 on page 93.)

## Study Conclusion

Wagner's Steriset container is superior at eliminating the possibility of external contaminants entering a closed container under storage and handling conditions. Steriset containers provide extra protection because it is a closed design container system with no pathway through the outer lid and inner valve, therefore bacteria cannot reach contents unless opened.

## Other Safety Issues

Before being opened, sterile packages should be inspected for package integrity. If the packaging is a rigid sterilization container system, the external latch, filters, valves and tamper-evident devices should be inspected for integrity. The lid should be inspected for the integrity of the filter or valve and the gasket.<sup>3</sup> For disposable filters, this means the circulator must remove filter retention plate(s) in order to do a complete inspection of the filter before the items are handled by the scrub person.

As mentioned earlier, Wagner's Steriset container design helps to significantly reduce user errors that surround disposable filters and locks. Common errors include:

- ▶ Forgetting to replace disposable filters before every use;
- ▶ Forgetting to inspect disposable filters for pinholes before every use;
- ▶ Incorrectly replacing a disposable (i.e., not positioning it correctly);
- ▶ Forgetting to use disposable locks before sterilizing the set;
- ▶ Insufficiently securing disposable locks to ensure set is adequately sealed.

All of the above insecurities are eliminated by the Steriset container design.

Event-related shelf life means dependence on the physical integrity of the sterile packaging. However, if dust is able to strikethrough disposable filters in rigid containers; will the particulates be visible to the naked eye?

## Summary

As choices continue to increase perioperative nurses as well as sterile processing professionals have an essential role in evaluating and selecting products that may affect quality and safety of the surgical patient while being more ecologically responsible.<sup>9</sup>

When it comes to product selection, patient safety should be the principal concern. In an effort to do all we can to help decrease the chance of SSI in our patients, additional safety margins that help protect sterile instruments from external contaminants is definitely worth considering. †

## References

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Ms. Seavey is a member of several AAMI working group committees that are developing recommended practices and is currently a co-chair for the ANSI/AAMI Working Group for Hospital Steam Sterilizers performance standards. In addition she has lectured and authored many articles on various topics relating to perioperative services and sterile processing, locally, nationally and internationally.