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Reusable Surgical Gowns Yield Annual Health Care Economic Benefits- The Assessment of Annual Costs of Reusable Versus Disposable Surgical Gowns

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ABSTRACT

Reusable surgical gowns are important in hospitals and when compared to disposable surgical gowns offer significant economic benefits. This study was initiated to quantify the annual cost saving to hospitals by selecting the reusable surgical gown option by using data from 127 separate hospitals over the period of January to December, 2021. These laundries are all separate organizations with their own collection and processing methods, ownership, scale, and varying ages of equipment. All are in competitive markets and so it is assumed to be representative of the larger domain of U.S and Canadian laundries serving hospitals. Annual cost savings were calculated as the difference in annual disposable and reusable costs divided by the annual disposable cost (as a percent). For a representative hospital system there is nearly a 50% annual cost savings which accrues to the health care organization's bottom line. Said differently, selecting disposable surgical gowns increases the hospitals surgical gown budget by about 190%. For the entire U.S. health care system (6,129 hospitals), a shift to 90% reusable surgical gowns would yield a health care savings of about $354 million per year, a beneficial step.

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Introduction

Reusable surgical gowns can be evaluated by several metrics as a comparison to equivalent single-use surgical gowns. These comparisons include economic or annual cost evaluations as well as the environmental differences. Such comparative metrics allow hospital nurses, physicians, purchasing decision-makers, value-added professionals, suppliers, and manufacturers have quantitative data for the respective evaluations. The environmental benefits of reusable surgical gowns have been well documented and published [1]. Additionally, the risk of reusable surgical gowns in patient or personnel hospital-acquired infections, studied over a 50 year period was demonstrated to be inconsequential [2].

The annual cost metric is a challenge when done at a detailed level (hospital space charges, labor, laundry, disposal, etc.). However, at an overall hospital level these annual economic evaluations are readily available through the laundry organization records. This novel economic evaluation tool was developed and utilized for cleanroom reusables versus disposables personal protection equipment (PPE). This was published in 2021.

The single-use and reusable surgical gowns have different materials of construction and hence different supply chains, but largely achieve the same style garment, Figure 1.

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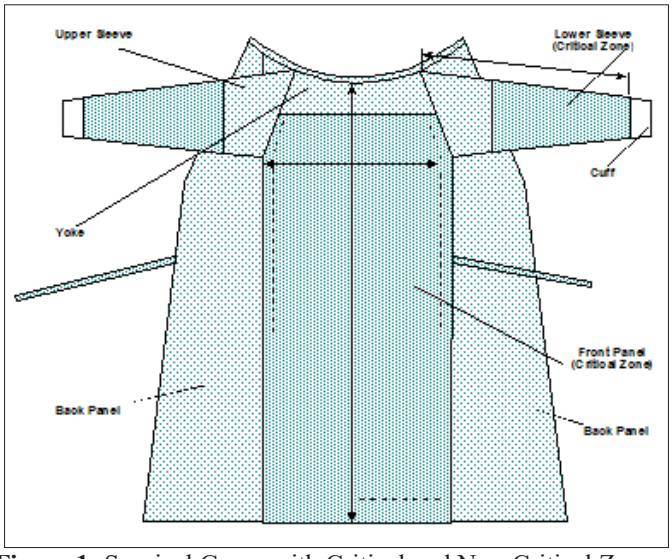

Figure 1: Surgical Gown with Critical and Non-Critical Zones

The critical zones are where resistance to liquid permeation is important for the medical team and the patient. The degree of resistance leads to level 1, 2, 3, and 4 surgical gowns, whether disposable or reusable. Reusables are made in a large range of sizes from small to XXXXL, while disposables also have variation in sizes, critical zones, etc.

An integral part of the economic evaluation of reusable surgical gowns is the laundry cycle wash and drying with sometimes sterilization [3]. The reuse phase integrates water use, cleaning chemicals, and energy for washing and drying to continue the use cycle. Reusables are typically more durable and weigh more, thus allowing large numbers of recycle loops (50 to hundreds). Thus, reusables more expensive to manufacture, but when calculated across the large number of use cycles, make these less expensive than single-use items. Environmental comparisons have consistently verified that the single-use textile garments have a significantly higher adverse impact on the environment for all metrics, such as energy, global warming potential (GWP), facility solid waste, water, and others [4]. From and environmental comparison perspective, nearly 20 studies evaluating disposables versus reusables have consistently documented the benefit of reusables [5].

The physical characterization of the two surgical gowns is in Table 1.

Table 1: Surgical Gowns Evaluated in Life Cycle Study

Surgical Gown	Reusable weight, g	Disposable weight, g
Level 3	490	245

Methods

The approach taken has been to assemble annual cost data for the processing of reusable surgical gowns, utilizing a number of large laundry organizations and corresponding hospitals. These costs can then be compared the equivalent number of disposable gowns. These data consisted in annual cost charged by the laundry and number of gowns processed. Additionally, the reusable information included the estimated number of cycles. These were assembled to allow evaluation of a representative scenario for the reusables. The total reusable processing costs included both the processing and the purchase of new gowns as a 2021 annual value. For the disposables, the number of reusable gowns processed in 2021 was used to define the number of equivalent disposable surgical gowns needed. The cost of disposable were also obtain from a supplier. Cost savings (as %) were calculated as [D-R]*100/D, where R is the 2021 annual laundry costs for the annual number of gowns processed for each hospital and the D is the new cost for the same number of disposable gowns as used by the same hospital. This novel and direct method to assess the economics of both the reusable and disposable surgical gowns was the same as used and published for cleanroom coveralls [4].

Results

The hospital-wide economic analysis method used in cleanroom coveralls was applied to hospital surgical gowns. The data received were from five States or regions of Eastern U.S. and Canada. The information was from 127 separate hospitals over the period of January to December, 2021. These laundries are all separate organizations with their own collection and processing methods, ownership, scale, and varying ages of equipment. All are in competitive markets and so it is assumed to be representative of the larger domain of U.S and Canadian laundries serving hospitals. The annual number of surgical gowns processed per hospital ranged from about 6,300 to about 640,000.

Economic results are provided in Table 1. Reusable are heavier, but have use cycles of about 60 (across the study of about 127 health care facilities). The number of cycles is reported before replacement due to ragout or other loss and was found to be 60. The single U.S. disposable basic level 3 surgical gown has a cost of $3.80. Laundry processing costs included price of replacements of reusable surgical gowns

Cost savings is calculated as the difference in annual disposable and reusable costs divided by the annual disposable cost (as a percent). On an annual cost basis, the reusable surgical gowns are less expensive (48%) than half the system in which disposables are provided. In other words, selecting disposables is nearly 190% more expensive.

These results for these 127 hospitals offers insights to the U.S. national financial benefit in cost savings to the hospital sector from selecting reusables surgical gowns. If we assume that in this study the hospitals in the U.S. have the usual range of size, then we can expand the cost benefit data for the approximate 6,129 the U.S. hospitals. If all U.S. hospitals converted to reusable surgical gowns, instead of disposable surgical gowns, the U.S. hospital sector would save about $354 million per year. This illustrates the scale up of these economic studies to the U.s national hospital sector and the use of surgical gowns.

Table 1: Cost Savings from Selecting Reusable Surgical Gowns

January-December 2021 Annual Percent Cost Savings By Selecting Reusable Textile Versus Disposable Textile		
Laundry Service	**Surgical Gowns**	
1	Cost savings from selecting reusables, %	47
	Number of cycles	20
	Number of Hospitals Studied	5
2	Cost savings from selecting reusables, %	57
	Number of cycles	24-44
	Number of Hospitals Studied	57
3	Cost savings from selecting reusables, %	63
	Number of cycles	40
	Number of Hospitals Studied	10
4	Cost savings from selecting reusables, %	3.4
	Number of cycles	66
	Number of Hospitals Studied	11
5	Cost savings from selecting reusables, %	86
	Average Cycles	84
	Number of Hospitals Studied	44
6	Cost savings from selecting reusables, %	28
	Average Cycles	78
	Number of Hospitals Studied	3

	Value Judged Representative for Cost Savings from Selecting Reusables, %	48
	Value Judged Representative for Reusables Cycles	60
	total of hospitals	127

Conclusions

Across a wide geographic region of health care facilities and for substantial differences in local competition, health care facility needs, size of annual laundry processing, and other factors there is a distinct annual economic benefit in selecting reusable surgical gowns. This averaged nearly 50% annual cost savings and accrues to the health care organization's bottom line regarding surgical procedures. Said differently, selecting disposable surgical gowns increases the hospitals surgical gown budget by about 190%. Combined with even greater reduction in environmental impacts and contribution to circularity, the overall contribution with reusables to economic and environmental sustainability is now well documented for surgical gowns [1]. On an annual U.S. health care basis, if all U.S. hospitals converted to reusable surgical gowns, instead of disposable surgical gowns, the U.S. hospital sector would save about $354 million per year. Such benefits can thus be used by individual hospitals, health care organizations, organizations providing and servicing these reusable products, and investors concerned about global climate impact.

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