

## Protective Apparel: Disposable vs. Reusable

As an admittedly reusable-oriented person, I feel compelled to respond to Skip Carlson's article<sup>1</sup> from an issue of *Infection Control Today*<sup>®</sup> and dispel readers of the misconceived notions that they may have acquired from its contents. The five areas of consideration Carlson cited will be addressed here in that same sequence.

The type of products Carlson refers to as single-use have until recently been known as disposable. As for those referred to as multiple-use, these are commonly known as reusable. The term "multiple-use" could be interpreted to mean that an item could be used for a variety of purposes. Basically, whatever the items are called, the reusable/disposable controversy that has been argued for many years.

### Functionality

Since Webster's Dictionary does not have a definition for this attribute, the question provided by the author will have to suffice: "Does the product demonstrate the attributes and perform the tasks ascribed to it by its manufacturer and the requirements set by the purchaser?"

Why did Carlson refer to The Association of periOperative Registered Nurses' (AORN) 1992 edition of *Recommended Practice for Surgical Gowns and Drapes* rather than their updated 1996 edition? He is incorrect in saying that they "provide a solid baseline for comparison and analysis." As succinctly stated by the title, the document is a *recommended practice* (RP) that represents what the professional perioperative nursing organization views as the optimum in that product category. As such, it provides a guideline that the perioperative nurse can use to assess the pros and cons of the different available products, thereby making it possible for the nurse to select the product that best suits the facility's needs.

Carlson fails to mention that a federal regulatory agency does indeed mandate the employer to provide the employee with protective apparel, that federal agency namely being the Occupational Safety and Health Administration (OSHA). In terms of protective apparel, OSHA's Final Rule on Bloodborne Pathogens<sup>3</sup> states that the item selected should be appropriate for the "task and degree of exposure anticipated." Unfortunately, at the moment, there is no universally accepted test methodology that enables the user to discriminate between the protective capabilities of the available products. However, two tests developed by the American Society for Testing Materials (ASTM)<sup>4,5</sup> are being used by a number of companies to demonstrate a product's performance capabilities.

Unfortunately, the results are reported on a "pass/fail" basis. Whatever "pass" may mean, it should be noted that the clinical literature clearly indicates that none of the products known to have passed the tests have been found to be impervious under either *in vitro* or *in vivo* situations.<sup>6,16</sup> In addition, rating the performance capability of a material on a "pass/fail" basis prohibits the purchaser from selecting a product that is appropriate for the "task and degree of exposure anticipated."

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Carlson comments about the influence that repeated processings (laundering and sterilization) have on the performance capability of a reusable "linen" product. For the most part, the reusable fabrics used in protective apparel are made of high-count, densely woven continuous filament micro-fiber polyester yarns. For that reason if no other, it is simply inappropriate for them to be referred to in such a casual manner. Actually, these fabrics are a modification of those originally developed for garments worn in sophisticated applications in the hi-tech industry where the propensity for a material to generate particulate contamination such as lint (which incidentally is cited as an item of concern in the AORN's RP) could not be tolerated. With a long-term record of their proven durability and high level of performance in that industry, the inherent hydrophobic nature of the polyester yarns makes them particularly suitable for use in garments requiring a liquid-repellent capability.

The fabric's fiber content used for some disposable protective apparel items has been a matter of concern for over two decades. Certain nonwoven materials contain cellulose (wood pulp) fibers that have been associated with post-operative complications such as keloids, wound dehiscence, incisional hernias, and chronic diseases. Furthermore, a study indicated that when a nonwoven cellulose laminate material was subjected to an abrasion test normally used for woven reusable materials, it produced almost 632 times as much lint by weight as the woven material with which it was compared. This phenomena exemplifies the need to review the fiber content of the materials used as well as studies in animals that demonstrate the low tissue reactivity of the chemical finishes with which they have been treated.<sup>7</sup>

### Quality

Certainly, every reusable textile has a life expectancy, and the manner in which it is processed can dramatically influence its long-term performance capability. AORN recognizes this influence in their prevailing RP<sup>2</sup> by citing the importance of the product being processed according to "the manufacturer's written instructions."

However, in terms of what has been so astutely described by the American College of Surgeons (ACS) Committee on the Operating Room Environment (CORE) as "usual conditions of use", the same type of abuse, *i.e.*, puncturing, cutting, abrasion, etc., that can impair the effectiveness of a disposable (single-use) item can similarly impair the effectiveness of a reusable. It is important that the community realize tests may be performed on a material under controlled laboratory conditions cannot be viewed as being the equivalent of those to which the item will be subjected "under usual conditions of use."

### Cost-in-Use

More commonly known as "cost-per-use," this component of the value analysis process is perhaps more important today than at any time since its conception. Initially, as Carlson states, the actual cost of using a product beyond its stated purchase price was the only factor considered in determining its cost-per-use. As the system became more refined, the quality of a product began to be viewed as an important element.

Today, however, the intense pressures to reduce let alone control the rapidly escalating costs in our nation's healthcare delivery system has been accompanied by a new definition of cost-effectiveness. It has little to do with the quality of the product, its price, or how well it serves its

particular purpose. Rather, it examines whether or not it is even needed and what harm, if any, would it cause the patient if it were not available.<sup>9</sup>

Historically, when single-use products first became available, they were not well received. During that period, the marketing strategies focused on single-use products being less expensive on a cost-per-use basis. This approach proved to be hard to sell. Of those hospitals that abandoned the use of reusables for the alleged economic benefits from using the single-use disposables, a search of the literature does not reveal even one facility that acknowledged it realized the projected savings that were predicted in the cost analysis prepared by the vendor.

However, popularity of the disposable products subsequently mushroomed when their use was skewed by a provision in the reimbursement system that permitted the single-use item to become a patient charge. Under those conditions, cost was irrelevant. Quite the contrary, since the hospital was not only to be paid for the throw-away but was also permitted to add a mark-up to recover its handling/distribution charge, these single-use disposables became revenue generators. (One patient reported having been charged \$25.20 for a surgeon's gown and \$28.90 for an incontinence pad that had been used while she was having glass removed from her hand.<sup>10</sup>) It should be noted that the provisions of today's prospective reimbursement system were based on what hospitals charged during that period.

### Logistics

"Logistics" is a military term identified as support services in healthcare institutions that procure, process (*i.e.*, launder and sterilize), and transport reusable supplies to their point of use. Rather than investing financial resources to update labor-saving laundry equipment and take advantage of the long-term economics from using the new generation of reusable textiles, hospitals now began spending money to pay for a new management skill dedicated to accommodate the disposal of the throw-away, paper-type products. Those expenses involved either having the waste hauled and dumped in a landfill somewhere or destroyed in an incinerator—two processes that required equipment, facilities, and manpower.

They failed to realize that many of the materials of which some of the single-use products were made were neither bio-degradable nor could they be burned, and these products were not about to rot away. Yet, they are still referred to as being disposable. Today, the cost of disposing of the items classified as infectious, hazardous, or regulated medical waste makes them expensive.

For example, in a recently published article

about "effective cost-reduction strategies in the management of regulated medical waste," the author states "that one area that remains a major expenditure for many medical facilities is the management and subsequent disposal of regulated medical waste...and that these expenses represent a significant portion of an environmental service's operating budget, often 10% to 20% of the total."<sup>12</sup>

Is the nonwoven, single-use, disposable segment of the textile industry concerned about these escalating costs? Absolutely. They have acknowledged this concern in their industry publication<sup>13</sup>, and although retaining their association's acronym, INDA, they have changed its name from the International Nonwoven and Disposable Industry to the Association of the Nonwoven Fabric Industry. Not to be overlooked is that since the promulgation of the Environmental Protection Agency's (EPA) new regulations in August 1998, the American Hospital Association (AHA) has made a "voluntary commitment to reduce total waste volume by 50% by 2010."<sup>14</sup> However, hospitals are beginning to find that they can generate even more revenue by replacing some of the traditional single-use, paper-like items with those that are reusable are proving to be economical.

For example, a group of surgeons practicing at two large teaching institutions reported on the results of their cost analysis of reusable vs. single-use disposable surgical textile products.<sup>11</sup> Compared with the disposable items, the reusables resulted in a savings of almost \$120,000, even though the institution using the disposables performed 3,730 fewer surgical procedures. Based on their findings, the group observed that "it is inappropriate for hospitals to place pressure on physicians to practice fiscal austerity in patient diagnosis and treatment and then to waste dollars on the expensive conveniences of modern 'disposable' society."

### Environmental Impact

In commenting about the environmental impact of discarding the disposables, Carlson cites references that are all eight to nine-years-old. There is not any item of cost associated with the use of disposable products that has results of a qualitative and quantitative assessment of its influence on generating surgical waste.<sup>15</sup> Measuring waste from 27 procedures, researchers found that single-use disposable textiles accounted for 39% of the weight, paper 7%, plastic 26%, and miscellaneous waste 27%. In volume, the single-use disposable fabrics and paper made up 69%, plastic 23%, and miscellaneous waste 7%. By using surgical gowns and drapes made of reusable materials, the hospital was able to reduce the weight of its waste by 73% and the volume by 93%.

### Making the Hard Choices

History indicates whatever type of "protective apparel" is worn, whether disposable (single-use) or reusable (multiple-use), the garments are certainly not an end unto themselves. Considering that the era of hazards associated with the transmission of bloodborne pathogens first emerged about 12 years ago, the healthcare provider community is to be commended for their astuteness for selecting the type of product that best meets their needs—both in terms of performance and economics. Furthermore, since it is likely that a majority of the gowns that have been and are being used do not "pass" the ASTM's tests, it is remarkable that no evidence anywhere indicates anyone has ever acquired any one of the pathogens as a result of blood having penetrated a protective-type garment. This fact may be attributable to the protection level with which every healthcare worker is provided by the all-time miracle fabric called skin—which is liquid-proof but porous, soft but tough, pliant but resilient, has built-in cooling ability, fits comfortably over every body bulge, has no seams, ties, snaps, zippers, or velcro closures, and repairs itself when torn.

Under no circumstance should this comment be interpreted to mean or imply that there is no need for protective apparel that affords both the level and extent of protection that the healthcare worker deems necessary. What is of utmost importance about a test method is that it assures healthcare workers that the protective apparel provides the level of protection needed. At the moment, that test has yet to be developed. As for asking the manufacturers to provide clinical data on their products as Carlson suggests, once again, there is no standard battery of test methods that can be used for that purpose. Even AAMI's Technical Information Report (TIR) that Carlson references has several test methods for some individual attributes. Other than adding to a garment's cost, the clinical data's value is questionable since the results demonstrated under controlled laboratory conditions may still not ensure the user of its performance "under usual conditions of use."

### Best Practices

Society in general is captivated by technology and short-term solutions, but there are no instant cures for long-term illnesses. Today's concerns for the environment are accompanied by a clear message that we can no longer throw things away as we have in the past. The waste we have generated never has, nor will it ever, disappear. The current ecological catastrophes are the result of many years of damage that we have inflicted upon our planet.

The most environmentally safe way to dispose of waste is simply never to generate it. If the problems confronting healthcare providers with the disposal of the waste materials were described in medical terms, it could be said that source reduction is what prevents the disease; recycling, incineration, and landfills only treat it. In addition to reusable textiles not compromising the quality of care rendered the patient, the providers will find that reusables are environmentally friendly and

are accompanied by the benefits of long-term economics as opposed to the short-term expenses of the alternatives.

The reusable/disposable controversy is really not one of dollars and cents but rather one of dollars and sense. The use of disposable (single-use) textiles in the US healthcare delivery system is destined to be recorded as one of the passing experiences in healthcare's relentless process of change. †

*Nathan L. Belkin, PhD, was a charter member of the original adhoc (ACS, AORN, and industry) Barrier Committee as well as AAMI's Aseptic Barrier Committee that was organized later for developing aseptic barrier materials. He has won several awards for his writing and expert knowledge in that area. He retired in 1991 and now resides in (Clearwater, Fla)*

For a list of references, contact the editor.

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