

Cost analysis of disposable/reusable surgical drapes used in Turgut Ozal Medicine Center

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Abstract

Aim: It was targeted to calculate unit cost of reusable and disposable surgical drape sets using benefit/cost analysis and to determine how much these sets cost for the general hospital budget.

Materials and Methods: The study was carried out in Inonu University Turgut Ozal Medical Center in Malatya city center, Turkey. In the study, a total of 500 packages and each package contain 7 drapes, 6 towels and 4 gowns. The packages, half of which are reusable and half of which are disposable and shared equally. Cost evaluation; it was obtained by calculating the purchase and waste disposal costs for disposable drapes. For reusable drapes, sewing, sterilization, washing, labor and waste disposal costs are calculated one by one. Afterwards, the total of costs obtained was analyzed and compared separately.

Results: As a result of the analysis, it was found that the cost of reusable surgical drapes were cheaper than disposable drapes, and using reusable surgical drapes could provide a 33.74% saving in overall annual cost for hospital budget.

Conclusion: Based on the novel findings; it is thought that by using reusable gowns and drapes can be contributed to the hospital's budget.

Keywords: Costs and cost analysis; disposable and reusable drape; surgical drape

INTRODUCTION

The sterile clothing and drapes for surgical process in hospitals was first produced in the 1960s to protect the patients and health care providers and to eliminate the risk of infection. There are two main types of surgical protective drapes: disposable and reusable. While the medical team usually uses disposable clothes such as gowns, caps, masks and galoshes during the operation, the use of reusable surgical drapes is preferred for patients (1). The preferred reusable fabrics in surgical textiles are produced by using the weaving system. Thanks to the fast developing technology and the sector, the type of fabric named muslin, which is easy to production, economical and believed to be a good barrier for infection, has begun to be preferred to use. In a study stated that, if the muslin is dry, it will have a barrier effect in the prevention of infection but it may lose this effect when it gets wet (2). As muslin is not able to form an effective barrier for bacterial transmission when wet, disposable surgical drapes are being produced as an alternative to reusable surgical drapes. Paper products were first tried in disposable surgical textiles, but their use was limited because these products were not very durable. Due to the fact that non-

woven paper products are not very durable, non-woven and less fiber-containing fabrics have been produced which are more durable than expanded paper thanks to technological developments. These fabrics have also begun to attract attention in the health sector as they can reduce infection rates (3).

Although there are many qualifications listed in the literature when evaluating the characteristics of surgical drapes, in a study conducted in this direction gathered these features in five headings; ergonomics, financial compliance, environmental friendliness, usefulness and protection of health professionals and patients from infection (4). Financial analysis costs of the projects, net cash inflows and economic profitability are important issues as in every industry also in the health sector. From this point of view, in the economic analysis of services or new projects carried out in health institutions; it can contribute to the budget of the state by taking into consideration the criteria such as the return period of the investment budget, the repayment period of the discounted amount, its current value, efficiency and cost benefit ratio (4). One of these methods, cost-benefit analyses is a financial evaluation method, that measures

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the costs and benefits of health investment projects and it demonstrates to the user whether the cost of the service provided is worthwhile (5,6). This method can be used not only in health sector but also in financial measurements of investment projects in all sectors, and it measures whether the cost of return on investment is exceeded (7). In this study, it was aimed to evaluate the financial analysis of the disposable and reusable surgical drapes used in our hospital by using the cost-benefit analysis method and also aimed to increase the dividend of hospital budget based on the obtained results.

MATERIALS and METHODS

Type and location of research

This descriptive research was carried out in Inonu University Turgut Ozal Medical Center, Malatya Turkey.

The universe and sample of research

There are 39 different operating rooms in our hospital and a total 500 packs (250 disposables and 250 reusable) were equally distributed to these rooms. Every packs consisted of 7 pieces of 2.20m drapes, 4 aprons, 8 towels.

Data collection

It has been reported that the average lifespan of the reusable surgical drapes used in studies is 75 cycles (8, 9). The data were collected from the "data tracking form" records that were filled by those responsible for the relevant units. Cost of disposable and reusable surgical drapes are tried to be taken into account from purchasing to final disposal. The economic analysis considered 3 cost contribution elements for disposable drapes: direct purchase cost, transport and waste disposal cost. Cost expenses of reusable surgical drapes were calculated by summing all costs incurred in purchasing, sewing, sterilization, laundry, personnel expenses. For electricity expenses, a unit price on the website of the electricity distribution company (AKSA Energy Inc.) was used in cost calculation. The detected unit prices of water in the web site of Malatya Water and Sewerage General Directorate was used for the cost of water. Depreciation expenses calculated using the installation cost and useful life of the

devices have been added to the cost of reusable surgical drapes. The calculation of the cost of medical waste was made according to the cost of the medical waste disposed per kg by the decision of the Local Environmental Council of Malatya.

Data evaluation

After the research data were collected, they were transferred to the SPSS (Statistical Package for Social Sciences) for Windows 22.0 package program, the statistical analysis of the data was made and descriptive statistics were used. Moreover, data for determining the cost of the work carried out was obtained collecting all expenses are denominated in Turkish lira.

Ethical aspect of the study

The study was approved by the Inonu University Scientific Research and Publication Ethics Board (Protocol Number: 2018/6-1).

RESULTS

The cost of sewing the reusable surgical drape is detailed in Table 1. Considering the amount of fabric and yarn used for the preparation of the drapes and the personnel work force, the cost of sew a pack was found to be 10.34 ₺. The cost of sterilization was calculated only for reusable surgical drapes. An autoclave machine performs 10 cycles per day and this cycle lasts an average of 70 minutes. The total labor expenses were determined by calculating the labor costs of folding and preparation of drapes and also calculating the autoclave workmanship. The number of personnel working in the folding and preparation process of each type of woven fabric, the unit folding and preparation time, and the labor cost per unit labor are multiplied and the labor cost per unit has been reached. The labor cost in 1 autoclave cycle was calculated by multiplying the number of persons with working time and hourly salaries. The cost of sterilization labor has been reached by collecting the folding and preparing labor per use and autoclave labor costs. When all the expenses for the sterilization process were calculated, it was determined that a pack is 15.77 ₺ (Table 2).

Table 1. The cost of sewing the reusable surgical drapes

| Base Components | Sub Components | Unit Price | Consumption | Cost Details | Total |
|--------------------|-----------------|-------------------------|--------------------|-----------------------------|----------------|
| Drape / Gown | Green Fabric | m ² = 11 ₺ | 580 m ² | 580 m ² x 11 ₺ | 6.380 ₺ |
| | Gauze | m ² = 6.75 ₺ | 120 m ² | 120 m ² x 6.75 ₺ | 810 ₺ |
| | Overlock Thread | 1 pcs= 2 ₺ | 1 pcs | 2 ₺ | 2 ₺ |
| | Coil Yarn | 1 pcs= 4 ₺ | 1 pcs | 4 ₺ | 4 ₺ |
| | Cuff | 1pcs= 0.8 ₺ | 60 pcs | 0.8 ₺ x60 | 48 ₺ |
| Staff | Manpower * | 1 hour= 12.77 ₺ | 16 hours | 16hx12.77 ₺ = 204.32 ₺ | 204.32 ₺ |
| Grand Total | | | | 10 Pack | 7.244 ₺ |
| | | | | 1 Pack/70 Cycle** | 10.34 ₺ |

* 1 hour manpower cost; it is calculated by dividing the total cost of an employee's net salary, meal and workwear by his monthly working hours

** It has been reported that the average lifespan of the reusable surgical drapes used in our study is 70 cycles

Table 2. Sterilization costs of reusable surgical drapes

| Base Components | Sub Components | Unit Price* | Consumption | Cost Details | Total |
|--------------------|---------------------------|------------------|-------------|------------------|----------------|
| Special Equipment | Biological Indicator * | 1 pcs =22 ₺ | 1 pcs | 22 ₺/10 Cycle | 2.20 ₺ |
| | Chemical Indicator * | 1 pcs =0.30 ₺ | 1 pcs | 0.30 ₺ | 0.30 ₺ |
| | Bowi - Dick Test Package* | 1 pcs =2.80 ₺ | 1 Package | 2.80 ₺/10 Cycle | 0.28 ₺ |
| | Autoclave Band | 1 pcs =4.54 ₺ | 1 Package | 4.54 ₺ /10 Cycle | 0.45 ₺ |
| Water | Mains Water | 1 Lt= 0.02 ₺ | 400L | 400Lx0.02 ₺ | 8 ₺ |
| | De-ionized Water | 1 Lt= 0.06 ₺ | 30L | 30Lx0.06 ₺ | 1.80 ₺ |
| Energy | Autoclave | 1 kWh=0.46 ₺ | 1.2kWh | 1.2kWhx0.46 ₺ | 0.55 ₺ |
| | Steam Generator | 1 kWh=0.46 ₺ | 22kWh | 22kWhx 0.46 ₺ | 10.12 ₺ |
| Staff | Manpower ** | 1 hour = 12.77 ₺ | 10.5 hours | 10.5hx12.77 ₺ | 34.08 ₺ |
| Grand Total | | | | 10 Pack | 157.78 ₺ |
| | | | | 1 Pack | 15.77 ₺ |

* Autoclave is used in 10 cycles during the day and 1 pcs/pack is consumed during the day

** All expenses of the personnel are included

Table 3. Washing and drying costs of reusable surgical drapes

| Base Components | Sub Components | Unit Price | Consumption | Cost Details | Total | |
|--------------------|-------------------------|-----------------|-----------------|---------------------|-------------------|--------|
| Chemicals | Main washing detergent | 13.4 ₺ | 240gr | 13.4 ₺ x 240gr/1000 | 3.21 ₺ | |
| | Blood remover detergent | 15.8 ₺ | 120gr | 15.8 ₺ x 120gr/1000 | 1.89 ₺ | |
| | Oxygen Bleaching | 6.8 ₺ | 300gr | 6.8 ₺ x 300gr/1000 | 2.04 ₺ | |
| | Neutralizing | 3.96 ₺ | 150gr | 3.96 ₺ x 150gr/1000 | 0.59 ₺ | |
| | Softening detergent | 4.8 ₺ | 120gr | 4.8 ₺ x120gr/1000 | 0.57 ₺ | |
| Staff | Manpower* | 1 hour= 12.77 ₺ | 0.5hour | 0,5hour x 12.77 ₺ | 6.38 ₺ | |
| Water | Mains Water | 1L= 0.2 ₺ | 900L | 0.02 ₺ x 900 | 18.00 ₺ | |
| Energy | Electricity | 1kWh= 0.46 ₺ | 5kWh | 0.46 ₺ x 5kWh | 2.30 ₺ | |
| Drying | Staff | Manpower* | 1 hour= 12.77 ₺ | 0.5 hour | 0.5hour x 12.77 ₺ | 6.38 ₺ |
| | Energy | Electricity | 1kWh= 0.46 ₺ | 10.5kWh | 0.46 ₺ x 10.5kWh | 4.83 ₺ |
| Grand Total | | | | 10 Pack | 37.89 ₺ | |
| | | | | 1 Pack | 3.78 ₺ | |

* 1 hour manpower cost; it is calculated by dividing the total cost of an employee's net salary, meal and workwear by his monthly working hours

The cost of washing and drying of reusable surgical drape is presented in Table 3. When the cost of washing was evaluated under the titles of chemicals used, amount of water consumed, energy consumption and employee wages, it was determined that washing and drying of 1 pack was costed to 3.78 ₺. For electrical expense; the amount of electricity that an autoclave consumes in a cycle was determined as kwh. The cost of electricity consumption in a cycle was calculated by multiplying the 1 kwh electricity cost by the amount of electricity consumed by an autoclave in a cycle. For the cost of water, the amount of water that an autoclave consumes in a cycle is determined in liters. The water consumption in a cycle was calculated by multiplying the amount of water consumed by the autoclave in a cycle and by 1 liter of water cost.

The average weight of the 1 kg wet pack was calculated as 9 kg and the average usage number of the reusable surgical drape was 70 times. The cost of medical waste for 1 pack was found by multiplying the unit price by the kg of pack and dividing it by 70. When this calculation was made, it was determined that the cost of medical waste disposal of a pack was 0.47 ₺. It was found that a daily cost of device maintenance-repair was 90.41 ₺. Table 4 shows the cost of disposable surgical drapes for the hospital budget. These costs were collected under two headings: purchasing process and medical waste costs. The cost of 1 disposable surgical set was determined to be 204.90 ₺.

Table 4. Costs of disposable surgical drapes

| | Unit Price | Consumption | Cost Details | Total |
|-----------------------|------------|--------------------|---------------|-----------------|
| Medical waste (kg)* | 3.40 ₺ | 3kg** | 3.40 ₺ x 3 | 10.2 ₺ |
| The process of buying | 194.70 ₺ | 1 Pack | 194.70 ₺ | 194.70 ₺ |
| | | Grand total | 1 Pack | 204.90 ₺ |

* According to the decision of the Local Environmental Council of Malatya, the disposal fee per kg is taken as a basis.

** The average of the total in the case was taken

DISCUSSION

Surgical drapes are used by health care providers during invasive procedures to minimize the risk of disease occurring, to help maintain a sterile surgical or procedure site (10). Reusable drapes are made of woven fabric and they are washed and sterilized after every use. Disposable drapes are generally made of nonwoven fabric and are destroyed after each use. Both reusable and disposable drapes have a cost in health institutions. Given the disproportion between existing resources and the growing demands of society, it is difficult to reduce costs without diminishing the quality of health care services (11,12). Although both types of drapes are used in health institutions, there is no consensus on which type of drape is less costly (13). In a study, it was reported that the use of disposable drapes was less likely to cause the infection to spread, although the cost of disposable surgical gowns and drapes was higher. Moreover, it has been suggested that if the cost of production and distribution of disposable products can be reduced by technological developments, it may become more attractive in the surgical drape market (14). In another study conducted in four universities, three public hospitals and one private hospital, it was found that the cost of reusable drape sets was 25-50 % lower than the cost of disposable drapes (15). Similar to these findings, in our study, it was found that if reusable surgical drapes are used, it could be provided 84.13 ₺ profit per pack. Contrary to these findings, the cost analysis of 8 different sets was investigated in a different study and it was found that reusable surgical drapes were costlier except for the Tur surgical drape, Percutaneous and Cystoscopy drape sets and also it has been found that an average of 33.74% cost savings can be achieved annually by using disposable surgical drapes (16). In another study conducted in a public hospital, it was found that using a disposable surgical drape system was more cost-effective.

LIMITATIONS

Only one hospital was selected for this study.

CONCLUSION

In this study, the unit cost of reusable surgical drape system was determined as 29.681 €/set; unit cost of disposable covering system was found to be 27.262 €/set. It was suggested that if the disposable drapes are used, the hospital can achieve a cost saving of 9.18 % in total costs (17).

It was observed that replacement of reusable surgical drapes with disposable drapes supports the discussions on economic feasibility. Considering the efficiency of the structural, environmental and financial resources and the dollar lability, it is thought that the use of reusable surgical drapes may be more advantageous in terms of cost. In this direction; disposable or reusable surgical drapes are important for patients as well as other users, so it is recommended to consider ergonomics in the production of these products. A high-quality and attractive drapes means expenditure so health care leaders need to select cheap but effective surgical drapes to contribute hospital budget. The knowledge gained from the study may help to replacing reusable surgical drapes for disposable ones, favoring arguments regarding the advantages and disadvantages of this possibility considering human resources, environmental and financial resources. In order to reduce the costs in both types of drapes, it is necessary to carry out studies and expand the environmentally friendly products through using technological facilities. When the use of multi-use covers is preferred in health institutions, the number of reuses, the number of laundering and drying process and the wear process should be checked and recorded. In order to ensure patient safety, the drapes that wear-out should be left out of use.

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