Cost–Effectiveness of Moist Exposed Burn Therapy

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In light of the increasingly limited health care resources, and as funding for health care is becoming a critical national concern, current reimbursement policies for burn care underscores the importance of cost containment in the management of these injuries. By taking into account both economic and clinical performance, ways to reduce expenditures without adversely affecting the quality of care are becoming of primary importance. Cost–effective burn wound management could indeed be developed without impairing the quality or delivery of health care. Use of Topical ointments and associated dressing materials are the highest expenditure items in a burn unit. Thoughtful assessment of these items with modification of unnecessary practices could result in great savings. Moist exposed burn therapy (MEBT) consists of frequent application of a moisture retentive ointment (MEBO) without the need of an overlying reinforcing dressing. This treatment modality is claimed to possess the advantages of both the open treatment method and the occlusive dressings without their disadvantages. In a prospective clinical study, cost–effectiveness of moist exposed burn therapy was assessed as compared to standard local burn care modalities. A very significant earlier spontaneous healing of second degree burns with significant reduction in overall total treatment cost was observed with MEBT.

Introduction

As economic times are changing, restrictions in overall health care reimbursement have challenged providers of health care to work smarter instead of harder, with more efficient and effective use of resources. Nevertheless, even in economically deprived areas, the burn care staff have continued, over the course of years to develop an approach to patient care driven largely by relatively plentiful resources with little concern to management cost. More than two decades ago, it has been shown that unpaid bills of burn patients admitted to one hospital during that period, and the proportion of these unpaid bills to total bills were two to six times greater than for non burn admissions. It has also been demonstrated that the average annual increase of hospital charges for burn care was growing about 10% per cent annually, higher than the consumer price index during the same period. As funding for health care is becoming a national critical concern, and workman's compensation, national, social, and medical security agencies, as well as private health insurance companies are attempting to limit their expenditures in the treatment of patients with burns, it has become the responsibility of the specialists in charge of burn care to create a cost–effective approach to quality burn treatment and rehabilitation.

Current reimbursement policies for burn care underscore the importance of cost containment in the management of burn injuries. There is, however, no evidence of a trade–off between high clinical performance and high economic performance. It is possible to achieve both at the same time. Cost–effective approach could be developed without impairing the quality or delivery of health care. By taking into account both economic and clinical performance, ways to reduce expenditures without adversely affecting the quality of care are becoming of primary importance.

In light of the already outlined increasingly limited health care resources, there is a need for reliable information relating costs to clinical outcomes. Despite this urgent need, burn care costs have been the subject of very few investigations and are among the least studied by health services researchers even though specialized burn care is among the most expensive provided care. Increase in cost of care of burn patients observed over the last few decades, was however substantially lower than that of general hospital care. This apparent cost efficiency is driven by a decreased length of stay closely correlated with aggressive surgical intervention for closure of the burn wound.
Early surgical excision and skin grafting has also contributed to decreased morbidity and improved survival and final outcome. Nevertheless, actually applied various local care modalities of burn wounds and frequent dressing changes, in spite of being painful, continue to be a significant component of the overall burn management scheme and sometimes the major modality of burn management available due to lack of proper facilities or adequate resources and continue as well to account for a large proportion of the cost per day for treating patients with burns. However, the cost varies, largely depending on the kind of materials used.

In a cost-reduction study reported by Mathews et al., five highest expenditure items in a burn unit have been identified. The used topical ointment was first on the list. In a measure to reduce cost, the authors have proposed to use a less expensive topical agent for superficial burns and for transitional stages of burn wound healing. In another amusing report, an easy, cost effective, quick and simple way of securing the burn dressings has been described reducing overall dressing cost as well. This is achieved by using an ordinary office staple and staple pins. The use of long, encircling gauze bandages for fixation of burn wound dressings around the torso and extremities is thus eliminated. These reports indicate that patient care goods and services can be streamlined without compromising the quality of care and without having an adverse effect on the final outcome. Thoughtful assessment of unnecessary and therefore, costly, clinical practices can result in changes that would reduce cost of care and actually at the same time improve its quality.

Moist exposed burn therapy (MEBT) is a relatively new concept in local burn wound management. It consists in frequent application of moist exposed burn ointment (MEBO) (Julphar–Gulf Pharmaceutical Industries, UAE) without the need of an overlying reinforcing dressing. The ointment is an effective moisture retaining agent that provides in addition to its pronounced debriding activity, antibacterial potential, and analgesic effect, the necessary moist environment for optimal wound healing. This treatment modality is claimed to possess the advantages of both the open treatment method and the occlusive dressings without their disadvantages. The benefits of the moisture retentive ointment on primary and secondary wound healing as well as on scar quality have already been described. The unit cost of the moisture retentive ointment as well as its overall cost for the whole treatment, remains, however, a major source of concern preventing many practitioners already convinced by its effectiveness from adopting it routinely in the local care of burn wounds. The benefit–cost value of the ointment has already been analyzed in a previously reported study. Similarly, in the present study, cost–effectiveness of moist exposed burn therapy is being assessed.

Material and Methods

A prospective clinical study was conducted from September 2003 to December 2003 in 14 different hospitals in the Kingdom of Saudi Arabia (KSA). 52 patients with a second degree TBSA burns of 5 to 35% (average 12.55 ± 5.77) were included in the study after obtaining a signed informed consent from the patients or from their legal guardians. The procedures followed in the study were in accordance with the recognized ethical standards and with the Helsinki Declaration. 29 patients had flame burns (55.76%). Scald burns were observed in 19 patients (35.25%). Miscellaneous other causative factors were encountered in 3 patients (5.76%). 76.4% were males. Patients’ age range was 2–58 years (average 27.33 ± 14.8 years). All patients were admitted to the hospital and assigned randomly into two groups. One study group was treated with moist exposed burn therapy using the moisture retaining ointment (MEBO) under investigation, and a second control group received the standard burn treatment for the given hospital. Agents used for local burn wound care are summarized in table 1. They were discharged only after full re-epithelialization was observed. 7 patients were excluded from the analysis due to protocol violations for age range (5–50 years) or for extent of burn (>15% TBSA for children and >20% for adults). 44 patients (22 in each group) were available for final analysis. The 2 groups were comparable for age, sex, etiology of burn, and %TBSA burned (table 2).

As for the previously reported similar study, overall cost of therapy was evaluated by estimating both direct and indirect costs. Direct cost included actual cost of the topical agent used, intra–venous fluids, concomitant
antibiotics, analgesics and other pharmaceutical agents and preparations, such as gloves, catheters and dressing materials. Direct cost included also cost of hospitalization as well as the cost of all performed laboratory tests. Indirect cost was estimated by computing time spent by the treating physicians and nurses in attending to the various needs of the patients, such as dressing changes, debridement and bathing. Total cost of treatment as well as individual components (hospitalizations duration and cost, physician/nurse time, topical treatment, systemic antibiotics, analgesics, other medications, laboratory services and medical materials) were recorded, calculated (as per course of treatment or per day) and statistically analyzed with the Mann–Whitney test or the Welch correction test.

**Results**

A reduction of 20.24% in hospitalization time was observed for the study group as compared to the control group (very significant two−sided p=0.0056) (fig. 1). The overall reduction in treatment cost for the MEBO study group was significant (p=0.025) per course of treatment (fig. 2), but not significant (p=0.5653) per day though a 9.41% reduction in daily cost was observed. Difference between the 2 groups in treatment cost excluding hospitalization was not significant per course (p=0.1381), and per day (p=0.2700) despite a 25% reduction in daily cost achieved with moisture retentive ointment application. On the other hand difference in hospitalization cost including accommodation and physicians and nurses cost was very significant in favor of the study group (p=0.0051) per course of treatment (fig. 3) but not significant (p=0.4317) per day. The reduction in total time spent by physicians attending patients was significant (p=0.0216) per course (39.43% reduction achieved with MBT), but not significant per day of treatment (p=0.1546) despite a 23.14% reduction with MEBO application. The reduction in total time spent by nurses, however, was very significant (p=0.0095) per course of treatment yet not significant (p=0.2223) per day despite a 16.43% reduction (fig. 4). Cost of topical agent was 9% lower with MEBO per course of treatment and 2.4% per day of treatment. This difference was not significant. Similarly, the decrease in material cost including gloves, catheters, canulae, syringes, IV fluids, dressings, and cleansing solutions observed with MEBO per course or per day was not significant despite 36.43% and 28.05% reduction respectively. Reduction in systemic antibiotic cost achieved with MBT was 50.42% per course and 47.72% per day. These differences statistically were not significant. The same was observed for the cost of other medications cost. Analgesic cost per day was reduced by 60.8% with MEBO per course (significant p=0.0135) and 55.88% per day (significant=0.0271). Cost of laboratory tests (hematological, biochemical, and microbiological) was reduced by moisture retentive ointment application, however, this reduction is not statistically different per course nor per day of treatment. On the other hand, without including the cost of associated dressings, no significant difference was observed in the cost of MEBO ointment as compared to that of other topical materials applied even though the cost of MEBO was 9% less per day and 2.4% less per course of treatment (fig. 5).

All patients included in the statistical analysis had burns <15% TBSA for children and <20% for adults and had no underlying medical disease likely to affect healing. All patients in both study groups had a smooth hospitalization course till full healing and discharge. Though routine burn wound cultures were not part of the study protocol, none of the patients, in both groups, developed clinical burn wound sepsis or any other medical complication due to the burn injury itself or to the prescribed therapy. Although the pain during treatment was not directly assessed, it seems, however, that patients in the MEBO group had less pain judging by the significant reduction in required analgesia as compared to the control group and experienced less discomfort during local burn wound care.

Surgical debridement was required in 4.54% (n=1) of the MEBO treatment group, and in 18.18% (n=4) of the conventional treatment group (P >0.05). However, split thickness skin graft grafting was performed for only 2 patients (9.09%) from the second group (P >0.05). Physiotherapy for the range of motion was performed during the hospitalization course for 6 ±0.81 days (ranging between 5 to 7 days) in 22.72% (n=5) of the MEBO group. The same number of patients from the conventional treatment group required physiotherapy for an average duration of 14 ±5.7 days (ranging between 7 to 21 days). The observed difference in duration of physiotherapy between the two groups was, by the unpaired t−test, statistically significant (P =0.032). Immediately following healing, hyperemic
scars were noticed in 54.54% (n=12) of the MEBO group and in 68.18% (n=15) of the standard treatment group (P >0.05). However, pigmentation changes were noticed in 4.54% (n=1) and 31.81% (n=7) respectively. Fisher’s exact test revealed that this observed difference was statistically significant (P =0.0459). Scar hypertrophy, on the other hand, was detected in only 2 patients in the conventional treatment group (9.09%). This observation was not significant (p>0.05). Mild scar contracture was observed in 27.27% of patients from each group (n=6). However, deformity was noticed in only 2 patients (9.09%) from the standard treatment group, producing mild dysfunction in one patient (4.54%). This observation, however, was not statistically significant (P >0.05). Scar evolution with time, however, was beyond the scope of this present study.

Discussion

Benefit–cost analysis evaluating only the financial elements of a program is based on the assumption that the primary goal of a health care program is to save money. This raises serious philosophical and ethical concerns and should not be endorsed.2,26 A more ethical approach would be to determine whether the adoption of a new therapeutic modality offers better or equivalent results at reduced or similar costs. Difficulties in assessment arise when better results are achieved at an increased cost. In other terms, it should be determined whether the new therapeutic modality may save money being at the same time more effective in terms of attaining the goals, or it may save money and be at least as effective as the standard or it may have additional costs that could be justifiable by its additional effectiveness.27 However, it is rather inappropriate and even impossible to price tag added patients’ benefits and improved quantity and quality of life.2,10 Another methodology for estimating costs of burn injuries and the cost–effectiveness of the various methods of intervention would be estimation of losses that result from fires and burn injuries, and the comparison of the costs of actions to prevent subsequent losses with the resultant benefits in the form of loss reduction.28 This seems to be a complex and twisted way of analysis. However, it may be appropriate when the final result in terms of function, cosmetic appearance, or scar quality following any given treatment modality needs to be quantified and assessed.

In the present study, a very significant earlier spontaneous healing of second degree burns was achieved with the moist exposed therapy at a lesser cost of most of the measured parameters, even though some differences were not statistically significant probably due to the small size of the study and control groups. Overall total treatment cost was also significantly reduced by MEBO with a significant reduction of the physicians’ work load, and a very significant reduction of the nurses’ work load. The exact benefit of the reduction in work load and time spent with the burned patients by the concerned health personnel cannot be evaluated by the present study which only estimates the cost of labor affected. Measures to estimate the added benefits that may be derived from investing the health personnel during the saved time in other beneficial actions with other patients might only add to the cost–effectiveness of the moist exposed therapy and is an important parameter that must be considered in future cost–benefit studies. Even though no significant difference between the cost of MEBO and that of the other topical agents was observed, when the cost of dressings is added to the cost of topical materials, the extent of savings realized by moist exposed therapy without an overlying dressing become clearly evident. Moreover, better scar quality following primary and secondary healing with moisture retentive ointment application has already been reported20,23–25. This may mean that resultant scars following MEBO application may require fewer scars related treatment modalities and perhaps less secondary corrective procedures that by itself may make MEBO application a more cost beneficial local burn wound care modality.2

MEBT is a valid alternative to local care of 2nd degree burn wounds. In a previously published study, moist exposed burn ointment has been found to be a cost–beneficial alternative in the local management of minor to moderate second degree burns.2 Results of the present study confirm these earlier observations. Moreover, in addition to being less labor intensive, MEBT results in actual direct savings appreciated by all health care systems. Its real value, however, can be appreciated better if the reduction in estimated losses due to poor healing and scarring are accounted for. Positive investment of the saved physicians’ and nurses’ time adds further to the cost effectiveness of this new local burn wound care modality.
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Table 1: Topical agents used in the control group

| Silver Sulfadiazine | Extract cepae 10%, heparin sodium 5000 iu and allantion | Panothenic acid | Chlorohexidine | Fucidic acid | Bacitracin zinc and neomycin sulphate | Povidone iodine | Sofratulle |

Table 2: Epidemiology of the study (MEBO) and Control groups

<table>
<thead>
<tr>
<th>PATIENTS</th>
<th>ETIOLOGY</th>
<th>AGE (years)</th>
<th>TBSA%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Female</td>
<td>Total</td>
<td>Scald</td>
</tr>
<tr>
<td>MEBO</td>
<td>16</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>Control</td>
<td>16</td>
<td>6</td>
<td>22</td>
</tr>
</tbody>
</table>

Figure 1: Duration of hospitalization of the two groups. 20.2% reduction in hospitalization with the MEBO group as compared to the control group.
Figure 2: Total treatment cost. MEBO application resulted in a reduction of 25.7% as compared to the control group.

Figure 3: Total hospitalization cost (accommodation, physicians and nurses cost). MEBO application resulted in 20% reduction as compared to the control group.

Figure 4: Time spent by physicians and nurses per course of treatment. MEBO application resulted in 39.43% reduction in physicians’ time and 28.67% nurse’s time.
Figure 5: Cost per course of topical agents, medical materials, systemic antibiotics, analgesics, other medicines, and laboratory expenses for the two study groups.

References


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