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Evaluation and Optimization of The Cost of Dealing with Burns

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Abstract

Burn management is cumbersome and requires excellent material and human resources. The cost of a burn in a specialized hospital structure is a subject that is little covered in the literature. A prospective analytical study involving 77 burn patients was conducted in our training to identify the various factors influencing burns' cost and propose active solutions that could reduce it.

The onset of infection in a burned person triples the overall cost compared to that of an uninfected patient. The delay in initial treatment, transit through other hospital structures, and the shortage of nursing staff are the main factors in the increase in the burn cost.

New-generation devices would appear to decrease the cost of comprehensive burn management compared to traditional instruments.

Thus, local and general preventive measures would make it possible to reduce the overall cost of the burn while promoting the healing of the patient.

Keywords: Cost, Hospitalization, burn center

Introduction

The care of a burnt patient is different from that of another patient; it is heavier and more expensive in terms of materials and human resources. Indeed, a single patient can bring together up to six caregivers for a single task. The cost of the burn may be related either to intrinsic factors belonging to the patient himself (age, mechanism, SCB, depth) or extrinsic factors linked to the structure, the nursing staff, and the family.

The cost includes the burn in all its phases, from the acute phase to the after-effects with their repercussions on the socioeconomic life of the patient.

Thus, the overall cost of the disease includes the price of healing and sequelae, the cost linked to potential years of life lost (DALY "Disability-adjusted life years lost"); the direct destruction of material goods by the burn accident, which impacts the economic capital of the family as well as the cost of hospitalization of the patient. It is this cost of hospitalization that interested us, which includes Hospitalization costs in a burn center, complete assessments, antibiotics and blood products, materials for dressings and consumables, nutritional support as well as human resources.

This is a subject little covered in the literature, which is why we conducted a prospective analytical study on 77 burn patients treated in our training with three main objectives: To assess the overall cost of hospitalization of burn victims in our structure, underline and highlight the influencing factors, and propose active solutions to reduce the cost and improve the comprehensive care.

Patients and methods:

This is a prospective, descriptive, and analytical study lasting 1 year (2020-2021) within the burns service of the Mohammed VI University Hospital in Marrakech. We included patients hospitalized for a period of 1 month, treated in the acute phase (< 48h), and excluded children under 5 years old, incomplete files, patients who pass through other structures. as well as burns requiring secondary coverage (Registry…).

A total of 77 patients met the work duration and inclusion criteria were collected. The data were collected using practical exploitation sheets and "Microsoft Office Excel" and "IBM-SPSS Statistics" software.

Results

Epidemiological

The analysis of the age of our series shows that the average is 33 years, with extremes ranging from 5 to 90 years, with a majority represented by subjects aged over 60 years and 40 % of the patients were children aged between 5 to 13 years old. The socioeconomic level of our patients was Average at 43.3 %, Low at 52.8 %, and the RAMED plan covered 85 % of the patients. On average, the cost of taking care of the children was 29,000 DH / d against 47,000 DH / d for a subject over 60, i.e., 50 % more expensive. We also note that a child's hospitalization duration is 3 days on average compared to 25 days for an elderly subject.

Concerning the mechanism of the burn, the thermal burn represents 90 % of the burns in our series, with flame burns which are the most frequent in our study and which account for 55 % of the cases against 35 % of burns by scalding. We concluded that a flame burns costs about twice as much as a hot burn/day, which would be explained by the length of hospital stay of flame burns which is 3 times longer than scalding burns. Indeed, it is 15 days against 5 days for burns by scalding. On the other hand, flame burns most often require appropriate initial resuscitation (especially if respiratory burns); a more frequent change of dressing, and surgical procedures in the acute phase; while scalding burns benefit from a short hospital stay, with less dressing and heal faster, so their cost is lower.

Regarding the field study, an analysis of our series noted that 10 % of our patients presented an underlying site to the burn. Epilepsy in 25 % of cases, diabetes in 15 %, drug addiction in 8 %, and psychiatric pathology in 2 % of cases. Thus, we found that the presence of a defect was 10 % more expensive compared to a subject without a notable history.

Clinic

On average, the burnt skin surface area (SCB) of the patients in our series was 25 %. Regarding the depth of the lesions, 65 % of the burns were second-degree superficial to intermediate, against 35 % deep burns (2nd degree deep and 3rd degree). The analysis of the cost by depth showed that a deep burn cost, on average, was 35,200 hr / d against 27,500 hr / d for a superficial burn. Thus, the deep burn was 28 % more expensive than a superficial burn.

Regarding the occurrence of infection, the lack of nursing staff favoring the handling between patient boxes, lack of sterile materials, transit through other structures, and the delay in initial care would be the main risk factors that we incriminated.

In our series, infection occurred in about two-thirds of patients (62.2 %). By comparing patients with the same SCB, we found that a patient who does not become infected during his hospitalization costs 9,500 DHS / day with an average hospitalization of 9 days, while the patient who becomes infected costs 13,600 DHS / day with an average hospital stay of 30 days. In total, the hospital stay is three times longer, and the price increases by 42 % in the infected patient.

Treatment

In the therapeutic aspect, we analyzed the data concerning antibiotics and blood products, traditional and modern dressing equipment, consumables, nutritional support, and the human resources necessary to manage burned patients.

Regarding the transfusion of blood and its derivatives, it was noted that a patient is transfused about 7 times during his hospitalization at an average cost of 16,000 dhs / patient.

Regarding consumables, a burn patient consumes syringes, needles, tubes, gowns, caps, gloves and sterile drapes, catheterization equipment, and urinary and gastric probing. In our structure, a burnt person spends, on average, 528 hr / d on consumables and, on average, 150 sterile drapes/month. Particular attention was noted regarding the dressing where there is a significant difference between traditional dressing and modern dressing. The comparative study of dressings found that the conventional dressing costs 2000 dhs for 25 % of SCB against 3400 dhs for the contemporary dressing, or 40 % more expensive. In the end, traditional dressing costs around 1.5 or even 2 times less than modern dressing. Compared to other countries, the cost of dressing the burnt remains relatively correct. For example, the burns dressing prices are twice as much (for the same SCB).

Nutrition is a significant component in the management of burns. The supplements available on the Moroccan market, such as Promax or Fortimel, cost between 40 and 150 hr. Taking into account the increased caloric needs of the burnt in the acute phase, we found that a patient burned on a 25 % SCB consumes an average of 300 hr per day as a nutritional supplement. This cost is on top of the overall cost of his hospitalization.

Human resources and structure play a fundamental role in managing burns, and we will see that they can be an essential factor in increasing the overall cost. Our system has a burn service (6 beds) that drains all of southern Morocco and the region. 75 % of our patients come from a rural area, with 65 % having a low socioeconomic level and purchasing power, which contrasts with the high cost of the burn. For healthcare staff, our team comprises 3 teachers, 9 resident doctors, 9 state-certified nurses, and 1 physiotherapist but remains 7 times less numerous than in other structures (IRAN or INDIA, for example). In our system, human resources represent about 40 % of daily expenses, which remains very low compared to other countries such as India or a burn center expenses 70 % of daily costs in its nursing staff, which would be necessary to ensure quality care.

Discussion

The intrinsic factors influencing the cost of care are those linked to the patients, while the extrinsic factors are related to the structure, human resources, and drug treatments. Here, we will compare the data from our series to those from the literature. Regarding the influence

of age on the cost of the burn, it has been shown that the older a patient, the more expensive it is to take care of it. This analysis is also reported in the literature as in the study of the "Baskent university Ankara Hospital" **[1]**, which underlined the impact of the associated defects in the elderly subject as well as the healing, which is slower than in the child, which would significantly increase the length of hospitalization and therefore the overall cost of treating these patients. Thus, they find that in total, a child costs about 2 times less and that subjects over 50 costs 10 to 15 % more.

The causative agent of the burn is an essential factor that determines the patient's prognosis, the length of hospital stay, and, therefore, the cost of its management. A study by E W ter Meulen et al. **[2]** in South Africa showed that flame burns represented only 9 % of burns and cost 3.5 times more.

The presence of chronic diseases in a burnt patient is a severe factor in his burn and the structure that supports it. The consequences of such an association resulted in an increase in drug consumption, an increase in the length of hospitalization, and, therefore, the cost of the disease. In our study, we found that the presence of a blemish was 10 % more expensive compared to a subject without a notable history. A similar survey from the Uganda Hospital by Richard Odoch et al. **[3]** found that the combination of defects increased hospital stays by 7 days and cost 17% more.

Regarding the extent and depth of the burns, it is evident that the greater the surface area of the skin burned, the greater the consumption of materials and treatments. Also, the depth of the burn is a key element that determines the length of hospitalization of the burn victim and, therefore, the cost. In our series, the deep burn costs more than the superficial burn. This would be linked to the fact that a deep burn is more at risk of developing an infection and most often requires excision and necrosectomy during the phase. Acute. A similar study by Nel Brusselaers et al. **[4]** in Australia concluded that a 2nd and 3rd-degree burn costs 25 % more, and a burn of less than 10 % SCB costs twice as much. Then, a burn greater than 10 % SCB. The onset of infection during hospitalization of the burn victim is a significant factor that will directly increase the cost of its treatment. In our series, we found that the hospital stay was three times longer, and the price was 42 % higher for the infected patient. This increase was mainly related to the heavy consumption of antibiotic dressing materials and blood products. In this Indian study by Rajeev B et al. **[5]** published in India, infection would increase the overall cost of patient care by 35 %, and antibiotic therapy represented 8% of expenditure in burns with an expense. The equivalent of 1800 dhs / d for a patient who becomes infected.

Regarding the therapeutic aspect, transfusion is one of the most expensive injectable products a burn victim receives during hospitalization. A multicenter and comparative study by Tina Palmieri et al. **[6]** compared two transfusion strategies in two different groups, Hb < 10 and group Hb <7. According to them, there is no significant difference between the two groups in mortality, general or local infection, organ failure, and scarring. Thus, the conservative transfusion strategy if Hb < 7 will be 33 % less expensive with savings of up to 8000 days per patient and could be a solution to save the cost of transfusions and, in the long term, an effective solution to reduce the cost. Of the assumption of responsibility. The dressings constitute an essential part of the care of the burnt person, a source of significant material consumption. Our study analyzed the cost of dressings and showed that a traditional sauce costs about 1.5 or even 2 times less than a modern dressing. Indeed, an Australian study conducted at the "Royal Children's Hospital" by Emma Gee Kee et al. **[7]** showed that the use of silver-based tulle leads to a decrease in the frequency of dressing changes (every 3- 4 days), a reduction in pain and a faster epimerization of 3 days all while reducing the pain and the risk of infection.

The hospital structure and the delay in initial care can significantly impact the cost of care. In our series, 65 % of patients were admitted after D1 post-burn, resulting in a delay in the initial treatment. In this study in San Francisco and published by Shailvi Gupta et al. **[8]**, 60 % of patients encounter difficulties in accessing care for burns, which is responsible for a delay in initial care and an increase in the occurrence of burns. Infection and, therefore, an increase in the overall cost of the burn.

Conclusion

The interest in studying the cost of the burn has made it possible to identify the various obstacles to the management of the burn and to offer less expensive and practical solutions to reduce the overall cost. Several solutions could be envisaged, including The use of new generation dressings that are more expensive but more effective and less expensive; the creation of other burn centers to relieve congestion in southern Morocco; the Reinforcement of teams in human resources and adequate materials. Morocco is endowed with infrastructure capable of administering rigorous care for burns and exceeds the majority of African countries in this area. The application of these possible solutions needs to be tested in the near future and will allow Morocco to align itself alongside a leading European country in the management of burns.

Table 2.2 Disability-adjusted life years (DALYs) lost (in thousands) in 2015 by cause and country income level (WHO Health Statistics and Information Systems)

	Road traffic	Drowning	Fire and burns	Falls	Poisoning	All unintentional injuries
HIC	5690	770	613	5583	367	18,610
UMIC	27,631	5873	2408	8703	1683	61,774
LMIC	31,670	11,862	6579	14,241	3080	98,103
LIC	11,030	4150	2441	2982	1428	33,720

http://www.who.int/healthinfo/global_burden_disease/estimates/en/index2.html. Accessed 12 Sept 2017

Figure 1: DALY ("Disability adjusted life years lost"): Potential year of life lost caused by burns in countries with average GDP compared to other accidents.

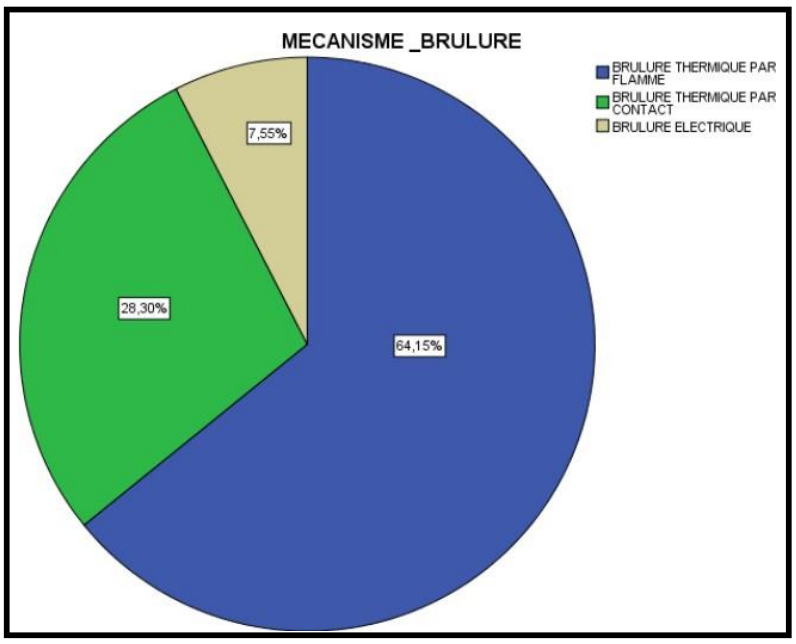

Figure 2: Distribution of the causative agent of the burn in our series

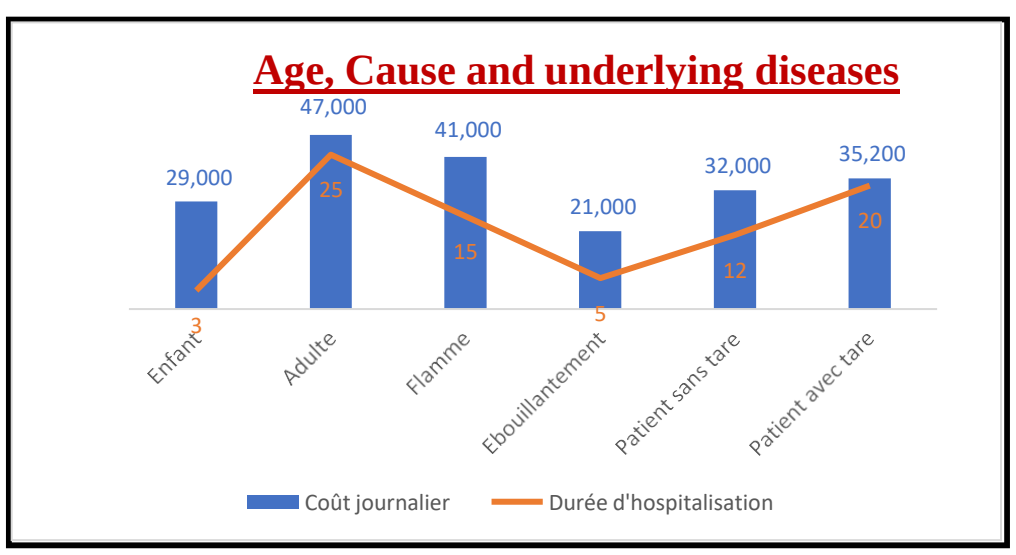

Figure 3: Influence of the various epidemiological parameters on the cost of treatment in our series.

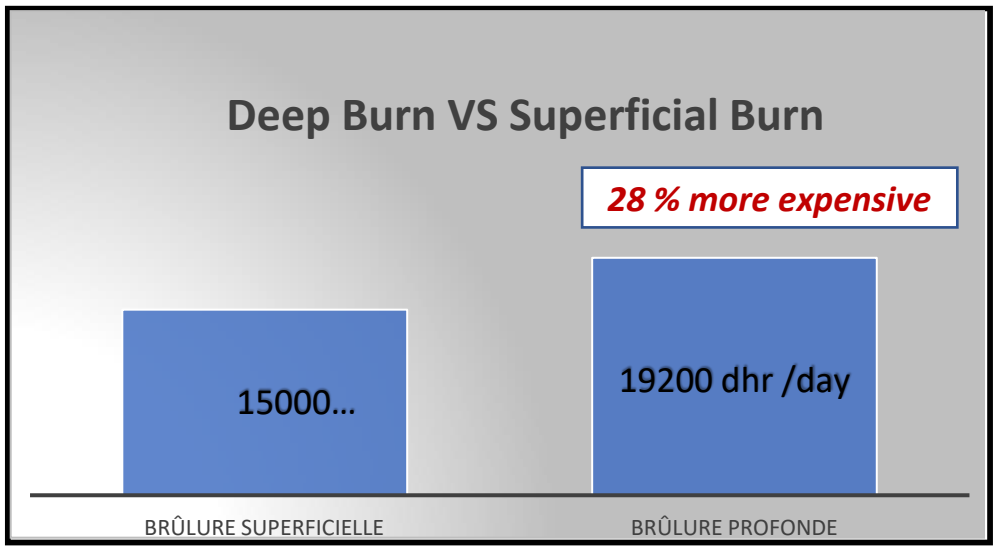

Figure 4: Cost according to the depth of the burn in our series

Patients non infecté	UN jour / MAD	9j /MAD
Prix d'hospitalisation en réanimation	1 800.00	16 200,00
Bilan complet	947.00	8 523,00
Ressources humaines	5 000.00	45 000,00
Pansement	1 495,92	7479,00
Médicaments et produits sanguin	413.95	5473,00
Consommable	528.45	4 756,00
TOTAL	10379,48	87 431,00

Patients infecté	UN jour / MAD	30J/MAD
Prix d'hospitalisation en réanimation	1 800.00	54 000,00
Bilan complet	947.00	14 205,00
Ressources humaines	5 000.00	150 000,00
Pansement	1 495,92	4 850,00
Médicaments et produits sanguin	812,00	24 360,00
Consommable	528.45	15 853,50
TOTAL	10185,32	303 268,50

Figure 5: Comparison of the cost of an infected and uninfected burn in our series

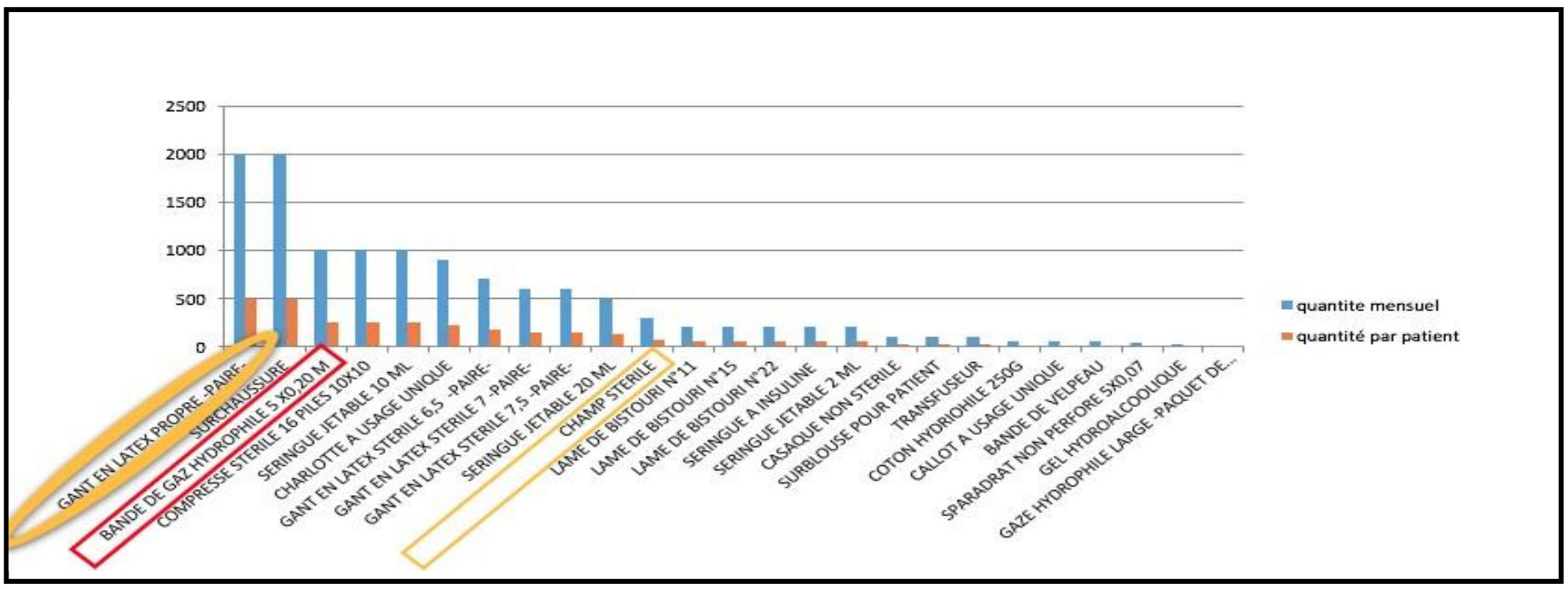

Figure 6: Consumable used for a burn on a 25 % SCB in our series

Nom d'hôpital	Nombre de médecin	Nombre d'infirmier	Nombre de lit (réanimation des brulés)	Soignant par lit
Motahary Burn Hospital ; Teheran IRAN[57]	4 enseignants + 11 residents	75	80	1.125
Lok Nayak Hospital, New Delhi INDIA[58]	4 enseignants + 23 residents	41 infirmiers + 1 kinésithérapeutes	50	1.38
Notre service	deux professeurs agrégés + une enseignante assistante + 7 résidents	9 + 1 kinésithérapeutes	6 lits	3.33

Figure 7: Human resources in our structure compared to other countries

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