

# BURN FUNCTIONAL OUTCOMES - VENTILATOR USAGE AND DISCHARGE AMBULATION STATUS OF PATIENTS IN A BURN WOUND IN-PATIENT CENTRE

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**SUMMARY.** Anticipating functional outcomes of patients managed in an in-patient burn wound centre can help in advising patients and their families of prognosis as well as assist case managers in discharge planning. The records of 37 burn patients were reviewed; one patient expired and was removed from further analysis. Data were obtained regarding patient characteristics, types and locations of burns and other wounds, ventilator use, level of mobility at hospital discharge, and disposition; three patients lacked discharge ambulation status and were removed from the outcome comparison analysis. Of the 36 patients, 17 had thermal burns and nine (25%) had associated inhalation injuries. Thermal burn patients ( $p = 0.02$ ), patients requiring ventilator support during their hospital stay ( $p = 0.04$ ), and those with inhalation injuries ( $p = 0.04$ ) were less likely to be ambulating independently or with assistance at discharge from the burn wound centre than other patients. This preliminary study suggests that patients with thermal burns and inhalation injuries and those requiring ventilator support were less likely to be ambulatory at hospital discharge. Further studies appear indicated.

## Introduction

Burn injuries result in about 45,000 hospitalizations yearly in the United States.<sup>1</sup> Anticipating functional outcomes of these patients can help physicians and staff advise patients and their families of prognosis as well as assist case managers in discharge planning.

Burn injuries and their complications - including inhalation injuries and other pulmonary complications, contractures, heterotopic ossification, limb damage requiring amputation, and peripheral neuropathies - may affect performance of functional tasks, including ambulation skills, transfer skills, and activities of daily living such as dressing and bathing.<sup>1-4</sup> The purpose of this study is to explore the association between respiratory failure and ambulation outcomes for patients in an in-patient burn wound centre.

## Methods

The project was reviewed and accepted by the Institution's human subjects review board. The records of 37 initial patients referred for Physical Medicine and Rehabilitation evaluation were reviewed; of these patients, one expired and was removed from the statistical analysis. Data in the burn wound centre computerized data base and in hospital records were obtained regarding patient characteristics, types and locations of burns and other wounds,

presence of inhalation injury, ventilator assistance for respiratory failure, level of mobility at hospital discharge, and disposition. Ambulation was defined as the ability to walk independently or with the assistance of another individual. Inhalation injury was diagnosed clinically. Ventilator days were calculated as the total numbers of days on ventilator support during hospital stay. Statistical analysis of the data was performed using ANOVA, chi square, the Mann-Whitney/Wilcoxon two-sample test, and the Fisher exact test. A  $p$ -value less than 0.05 was accepted as statistically significant.

## Results

The mean age of the 36 patients was  $45.94 \pm 16.04$  yr; 75% were male; 63.9% were Caucasian, with 30.6% African-American and 2.8% other races. Of the patients studied, 17 (47.2%) had thermal burns, with an average total body surface area (TBSA) of  $25.29 \pm 13.79\%$ ; the other patients had injuries including electrical burns, chemical burns, friction injuries, and necrotizing fasciitis. Ventilator support was required by all nine patients with inhalation injury as well as three without inhalation injury. There was no difference statistically for patient race (Caucasian vs other) ( $p = 0.62$ ), sex ( $p = 0.68$ ), mean patient age ( $p = 0.80$ ), or mean patient weight ( $p = 0.48$ ) between patients who did or did not require ventilator support. A

**Table I** - Cross-table showing walking ability at discharge, nature of burns, and ventilator use status

Ambulatory status at discharge	Totalno	Aetiology of burns and ventilator use status			
		Thermal burn Yes/no	Associated inhalation Yes/no	Lower limb burn Yes/no	Ventilator used Yes/no
Ambulatory with or without assistance	23	8/15*	3/20§	10/13	5/18*
Non-ambulatory	10	8/2§	5/5*	7/3	6/4§
Ambulatory status unknown	3	-	-	-	-
Total	36	16/18	8/25	17/16	11/22

\* Uncorrected chi-square significant ( $p < 0.05$ )  
 § Fisher exact chi-square significant ( $p < 0.05$ )

total of 10 (28%) patients were non-ambulatory at the time of discharge; three additional patients lacked data regarding ambulatory status at discharge, and they were excluded from further analysis.

The average age of the 23 patients who were ambulatory at hospital discharge was  $45 \pm 16$  yr (range, 17-75 yr) compared to  $54 \pm 14$  yr (range, 19-68 yr) for the 10 non-ambulatory patients ( $p = 0.11$ ). Of the patients with thermal burns, eight (50%) were ambulatory at hospital discharge compared to 15 (88%) with non-thermal injuries ( $p = 0.02$ ) (Table I); there was no significant difference in mean percentage of TBSA ( $p = 0.77$ ) between the ambulatory ( $24 \pm 15\%$ ; range, 1-45%) and non-ambulatory ( $26 \pm 15\%$ ; range, 12-55%) thermal burn patients. Of the 17 patients with lower limb burns, 10 (59%) were ambulatory at discharge, compared to 13 (81%) without lower limb burns (Table I).

Of the 33 patients with known discharge ambulation status, eight (24%) had inhalation injury; of these, only three (38%) were ambulatory, compared to 20 (80%) without inhalation injury ( $p = 0.04$ ) (Table I). As for the 22 patients who did not require ventilator support during hospitalization, 18 (82%) were ambulatory at discharge, compared to only five (45%) of those requiring ventilator support ( $p = 0.04$ ) (Table I). The mean ventilator duration for non-ambulatory patients was  $35 \pm 39$  days, compared to  $13 \pm 12$  days for those who were ambulatory at discharge ( $p = 0.36$ ).

### Discussion

The findings of this pilot study suggest that in-patients in a burn wound centre who were suffering from thermal

burns or inhalation injury or required ventilator support were less likely to be ambulatory at hospital discharge than the other patients (Table I). Like Schneider et al.,<sup>5</sup> this pilot study did not find any statistically significant relationship ( $p = 0.15$ ) between patients with lower extremity burn wounds and the independence of patient ambulation. There were also no statistically significant associations between mean ventilator support duration ( $p = 0.36$ ) or mean TBSA thermal burn size ( $p = 0.77$ ) and discharge ambulation status for the patients studied.

The pilot study was limited by its small sample size and retrospective design, leading to absent data for some patient parameters. Given these study limitations, more in-depth statistical analysis of the data was not performed. In addition, the influence of other co-morbidities on ambulation outcome was not investigated; a more detailed investigation of co-morbidities in burn wound patients in future studies would be helpful to establish a better correlation between medical complications in addition to respiratory failure and patient functional outcomes. A more formal assessment of patient function, such as the functional independence measure<sup>6,7</sup>, would also be helpful to better quantify patient performance at the time of hospital discharge; provision of intensive rehabilitation services may also influence patient functional levels prior to ultimate patient discharge.<sup>7</sup>

### Conclusion

Larger prospective studies taking these issues into account are needed to verify the trends seen in this pilot study and to determine underlying causes, such as other critical illnesses, and interventions associated with patient functional outcomes.

**RÉSUMÉ.** La possibilité de prévoir les résultats fonctionnels des patients traités en régime hospitalier dans un centre des brûlés peut se révéler être très utile pour les conseils qu'il faut donner aux patients et à leurs familles comme aussi pour l'assistance que les directeurs de la gestion des patients en dérivent pour la planification de la sortie de l'hôpital des patients. Les dossiers de 37 patients brûlés ont été examinés; un patient est décédé et ce cas a été éliminé de l'analyse. Les données considérées comprenaient les caractéristiques des patients, le type et la localisation des brûlures et des autres lésions, l'utilisation de la ventilation, le niveau

de mobilité à la sortie de l'hôpital et la disposition générale des patients; trois patients n'ont pas atteint la condition de pouvoir laisser l'hôpital en régime de déambulation et leurs dossiers ont été retirés de la comparaison des résultats de l'analyse. Sur les 36 patients inclus, 17 avaient des brûlures thermiques et 9 (25%) avaient des lésions causées par l'inhalation. Les patients atteints de brûlures thermiques ( $p = 0,02$ ), ceux qui nécessitaient le support de la ventilation au cours de leur séjour à l'hôpital ( $p = 0,04$ ) et ceux qui présentaient les lésions par inhalation ( $p = 0,04$ ) avaient moins de probabilité d'être ambulants de façon autonome ou avec assistance au moment de la sortie du centre des brûlés par rapport aux autres patients. Cette étude préliminaire pourrait indiquer que les patients qui présentaient les brûlures thermiques ou les lésions par inhalation et ceux qui nécessitaient un support ventilatoire étaient moins capables d'être ambulants à la sortie de l'hôpital. Il faudra donc conduire d'autres études.

#### BIBLIOGRAPHY

1. Esselman P.C., Thombs B.D., Magyar-Russell G. et al.: Burn rehabilitation: State of the science. *Am. J. Phys. Med. Rehabil.*, 85: 383-413, 2006.
2. Fisher S.V., Helm P.A.: "Comprehensive Rehabilitation of Burns", Williams and Wilkins, Baltimore, 1984.
3. Richard R.L., Staley M.J.: "Burn Care and Rehabilitation: Principles and Practice", F.A. Davis Company, Philadelphia, 1994.
4. Van-Baar M.E., Essink-Bot M.L., Oen I.M.M.H. et al.: Functional outcome after burns: A review. *Burns*, 32: 1-9, 2006.
5. Schneider J.C., Holavanahalli R., Helm P. et al.: Construction in burn injury: Defining the problem. *J. Burn Care Rehabil.*, 27: 508-14, 2006.
6. Choo B., Umraw N., Gomez M. et al.: The utility of the functional independence measure (FIM) in discharge planning for burn patients. *Burns*, 32: 20-23, 2006.

7. Sliwa J.A., Heinemann A., Semik P.: In-patient rehabilitation following burn injury: Patient demographics and functional outcomes. *Arch. Phys. Med. Rehabil.*, 86: 1920-3, 2005.

This paper was received on 22 May 2009.

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