Burns Open xxx (2017) xxx–xxx

Contents lists available at ScienceDirect

Burns Open

journal homepage: www.burnsopen.com

Effects of demographic and socioeconomic factors on the use of skin substitutes in burn patients

Rachel M. Nygaard, Frederick W. Endorf *

Department of Surgery, Hennepin County Medical Center, 701 Park Ave., Minneapolis, MN 55415, USA

ARTICLE INFO

Article history:
Received 12 June 2017
Received in revised form 11 July 2017
Accepted 12 July 2017
Available online xxxx

Keywords:
Burns
Skin substitutes
Demographics
Socioeconomic

1. Introduction

Demographic and socioeconomic factors influence the delivery of health care in many ways. Insurance status, race, and gender have all been shown to influence decision-making in health care through differential access to care or via discrepancies in choices of treatment in variable groups of patients [1–7]. In burn patients, skin substitutes are commonly used for several indications, including for temporary or staged coverage when there is a shortage of donor sites in very large burns, as well as cosmetic concerns. However, in small to moderate-size burns, there may be a choice between immediate autografting versus using a skin substitute (followed by subsequent autografting). These skin substitutes may offer practical advantages as well as some theoretical cosmetic benefits to the patient, but are often expensive. We wanted to examine whether demographic and socioeconomic factors affect the decision to use skin substitutes in burn patients. Based on the preponderance of health disparity findings in the non-burn literature, our hypothesis was that non-whites and patients with non-commercial insurance would be less likely to get skin substitutes.

2. Methods

The National Burn Repository (NBR) is a national database of burn patients supported by the American Burn Association (ABA). We used NBR version 8.0, which encompassed data on patients from 2002 to 2011. We limited our search to patients with percent total-body surface area (TBSA) burns between 10 and 50 percent who underwent any type of surgical procedure in which they had autografting or received a skin substitute followed by autografting. Skin substitutes included xenografts, homografts (i.e. cadaveric allografting), and dermal regenerative grafts (synthetic dermal substitutes). We made the assumption that patients with burns above 50% TBSA would almost always get a skin substitute as part of their care, and that patients with less than 10% TBSA burns would very rarely require a skin substitute. We also felt that those patients with small burns requiring skin substitute likely had an obvious medical need, such as exposed tendon or infection. Demographic variables recorded included age, gender, race, comorbidities, and payer status (Table 1). Comorbidities were given as a binary variable, with patients either having one or more comorbidities or having no comorbidities. For payer status, commercial insurance was defined as private insurance or worker's compensation. Non-commercial insurance included Medicare/Medicaid, self-pay or no insurance. Other patient characteristics included burn size (TBSA), presence of inhalation injury, hospital days, ICU days, hospital charges, and mortality (Table 1). The total cohort was then divided into two groups, one group who received autografting alone and another group who received a skin substitute followed by subsequent autografting. These two groups were compared across all variables using Student's *T*-test for continuous variables and Chi^2 analysis for categorical variables (Table 1). Then, these patients were broken down into another sub-analysis using four groups: whites with commercial insurance, whites with non-commercial insurance, non-whites with commercial insurance,

* Corresponding author. Fax: +1 (612) 904 4245.
E-mail address: author.endorf01@gmail.com (F.W. Endorf).

http://dx.doi.org/10.1016/j.burnso.2017.07.002
2468-9122/

Table 1
Characteristics of study cohort.

	Study cohort (*N* = 14821)	Autograft alone (*N* = 8885)	Autograft + skin substitute (*N* = 5936)	*P* value[1]
Age years, mean (SD)	35.9 (22.9)	34.8 (22.8)	37.5 (23.0)	<0.001
Gender male, N (%)	10412 (71.1)	6341 (72.1)	4071 (69.5)	0.001
Race white, N (%)	8376 (60.0)	5029 (60.2)	3347 (59.8)	0.712
Comorbidities, N (%)	2864 (19.6)	1679 (19.1)	1185 (20.2)	0.203
Inhalation injury, N (%)	1855 (16.1)	941 (13.2)	914 (20.8)	<0.001
Burn size[2], mean (SD)	21.1 (10.1)	19.4 (8.9)	23.6 (11.2)	<0.001
Payer commercial, N (%)	5539 (44.1)	3189 (43.3)	2350 (45.2)	0.035
Hospital days, mean (SD)	27.6 (25.3)	22.3 (18.6)	35.6 (32.3)	<0.001
ICU days, mean (SD)	16.0 (21.9)	13.0 (17.3)	20.7 (26.8)	<0.001
Vent days, mean (SD)	8.3 (20.20	5.6 (18.5)	12.3 (21.9)	<0.001
Hospital charges (thousands), mean (SD)	275.5 (200.6)	175.5 (252.4)	411.6 (510.2)	<0.001
Outcome alive, N (%)	14038 (94.7)	8478 (90.2)	5560 (93.7)	<0.001

Abbreviations: ICU, intensive care unit; SD, standard deviation.
[1] Student's *T*-test for continuous variable and Chi[2] for categorical variables.
[2] Cohort limited to 10–50% TBSA.

Table 2
Subgroup analysis.

	(*N* = 12032)	White + Commercial insurance (*N* = 3578)	White + non-commercial insurance (*N* = 3729)	Nonwhite + commercial (*N* = 1695)	Nonwhite + non-commercial (*N* = 3030)	*P* value[1]
Age years, mean (SD)	37.2 (22.4)	38.9 (18.6)	44.4 (23.6)	33.8 (19.9)	29.2 (23.3)	<0.001
Gender male, N (%)	8602 (71.5)	2757 (77.1)	2657 (71.3)	1239 (73.1)	1949 (64.3)	<0.001
Inhalation injury, N (%)	1476 (15.6)	431 (15.2)	652 (17.3)	208 (11.7)	401 (12.5)	<0.001
Burn size[2], mean (SD)	20.9 (10.0)	21.0 (10.0)	21.1 (10.0)	20.1 (9.8)	20.9 (10.0)	<0.001
Burn size, N (%)						0.157
10–19%	6736 (56.0)	1983 (55.4)	2059 (52.2)	1011 (59.7)	1683 (55.5)	
20–29%	2945 (24.5)	900 (25.2)	914 (24.5)	380 (22.4)	751 (24.8)	
30–39%	1485 (12.3)	431 (12.1)	489 (13.1)	193 (11.4)	372 (12.8)	
40–50%	866 (7.2)	264 (7.4)	267 (7.2)	111 (6.6)	224 (7.4)	
Hospital days, mean (SD)	27.8 (29.2)	24.7 (22.4)	29.6 (26.5)	25.2 (21.9)	30.4 (29.2)	<0.001
ICU days, mean (SD)	16.2 (22.2)	14.8 (19.9)	18.9 (24.1)	13.3 (21.2)	16.0 (22.6)	<0.001
Vent days, mean (SD)	8.4 (18.9)	6.9 (15.7)	10.3 (19.2)	6.9 (17.5)	8.7 (22.0)	<0.001
Hospital charges (thousands), mean (SD)	280.8 (410.0)	258.1 (380.7)	306.9 (454.1)	274.4 (363.0)	282.7 (421.5)	<0.001
Autograft alone N (%)	7046 (58.6)	2083 (58.2)	2206 (59.2)	945 (55.8)	1812 (59.8)	0.043
Outcome alive, N (%)	11436 (95.1)	3453 (96.5)	3440 (92.3)	1651 (97.4)	2892 (95.5)	<0.001

Abbreviations: ICU, intensive care unit; SD, standard deviation.
[1] Welch's ANOVA for unequal variances in continuous variables and Chi[2] for categorical variables.
[2] Cohort limited to 10–50% TBSA.

Table 3
Regression.

	OR (CI)	*P* value	Adjusted OR (CI)	*P* value[1]
Age	1.01 (1.00, 1.01)	<0.001	1.01 (1.00, 1.01)	<0.001
Gender	1.13 (1.05, 1.22)	<0.001	1.21 (1.09, 1.33)	<0.001
Race	1.02 (0.95, 1.09)	0.712	–	
Inhalation injury	1.73 (1.57, 1.91)	<0.001	1.37 (1.21, 1.55)	<0.001
Burn size[2]	1.04 (1.04 (1.05)	<0.001	1.04 (1.04, 1.05)	<0.001
Burn size group		<0.001	–	
10–19%	Ref		–	
20–29%	1.47 (1.35, 1.59)	<0.001	–	
30–39%	2.30 (2.07, 2.54)	<0.001	–	
40–50%	3.94 (3.45, 4.49)	<0.001	–	
Payer	0.93 (0.86, 0.99)	0.035	–	
Group		0.043	–	
White Commercial	1.07 (0.97, 1.18)	0.192	1.14 (1.01, 1.29)	0.041
White non-commercial	1.03 (0.93, 1.13)	0.592	1.00 (0.88, 1.14)	0.999
Nonwhite commercial	1.18 (1.05, 1.33)	0.007	1.50 (1.29, 1.74)	<0.001
Nonwhite non-commercial	Ref		Ref	

Abbreviations: ICU, intensive care unit; OR, odd's ratio, CI, 95% confidence interval.
[1] Logistic regression.
[2] Cohort limited to 10–50% TBSA.

and non-whites with non-commercial insurance. These groups were analyzed using Welch's ANOVA for unequal variances in continuous variables and Chi[2] for categorical variables (Table 2). Finally, logistic regression analysis was performed to find odds ratios predicting receiving skin substitute for each variable (Table 3). All analyses were conducted using STATA 14.1 (StataCorp

Please cite this article in press as: Nygaard RM, Endorf FW. Effects of demographic and socioeconomic factors on the use of skin substitutes in burn patients. Burns Open (2017), http://dx.doi.org/10.1016/j.burnso.2017.07.002