Outcomes of Morbidly Obese Patients Receiving Invasive Mechanical Ventilation

A Nationwide Analysis

Gagan Kumar, MD; Tilottama Majumdar, MD, FCCP; Elizabeth R. Jacobs, MD, FCCP; Valerie Danesh, MS; Gaurav Dagar, MD; Abhishek Deshmukh, MD; Amit Taneja, MD; and Rahul Nanchal, MD, FCCP; from the Milwaukee Initiative in Critical Care Outcomes Research (MICCOR) Group of Investigators

e-Table 1. ICD-9-CM codes used for selection of etiology associated with mechanical ventilation

Pneumonia	480-487, 507.0
COPD exacerbation	491.1, 491.2
Asthma exacerbation	493.x1, 493.x2
Cardiac arrest/ Ventricular fibrillation or flutter	427.41, 427.42, 427.5
Acute coronary syndrome	410.x0,410.x1
Acute Congestive heart failure	276.6, 428.21, 428.23, 428.31, 428.33, 428.41, 428.43
Stroke, intracranial hemorrhage, subarachnoid hemorrhage	433.x1, 432.9, 431, 430
Severe sepsis	See Martin et al. N Engl J Med. 2003 Apr 17;348(16):1546-54.

e-Table 2. Multivariable analysis of risk factors associate with invasive mechanical ventilation

	Odds ratio	95% confidence interval
Morbid Obesity	1.37	1.20-1.57
Age group		
18-34	Reference	
35-49	1.29	1.26-1.32
50-64	1.38	1.35-1.41
65-79	0.93	0.90-0.95
Gender		
Male	Reference	
Female	0.79	0.78-0.80
Race		
White	Reference	
Black	1.06	1.04-1.08
Hispanic	0.96	0.94-0.98
Asian	1.03	0.99-1.07
Insurance		
Medicare	Reference	
Medicaid	1.08	1.06-1.10
Private	1.25	1.23-1.28
Self	1.55	1.51-1.59
Etiology		
Severe Sepsis	5.34	5.26-5.42
Pneumonia	4.39	4.34-4.44
COPD exacerbation	1.59	1.56-1.62
Asthma exacerbation	1.11	1.08-1.14
CHF exacerbation	1.20	1.17-1.23
Acute coronary syndrome	1.92	1.88-1.96
Cardiac arrest	23.5	22.9-24.1
Stroke	3.11	3.05-3.18
Number of organ failures		
0	Reference	
1	2.89	2.85-2.93
2	5.15	5.06-5.25
3	8.11	7.90-8.32
4	10.3	9.94-10.8
5 or 6	12.5	11.4-13.7
Admission type		
Elective	Reference	
Urgent care	1.19	1.16-1.22
Emergency room	1.47	1.44-1.49
Trauma	15.2	14.5-15.9
Others	1.44	1.41-1.48

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e-Table 3. Models used for examining odds ratio of mortality - morbidly obese vs. non obese.

	OR	95% CI
Model A: Unadjusted	0.49	0.47-0.51
Model B: Adjusting for age, gender, race, hospital characteristics, and co-morbid index	0.57	0.55-0.59
Model C: Adjusting for variables in model B and causes for IMV	0.68	0.65-0.71
Model D: Adjusting for variables in model C and organ failures	0.71	0.69-0.74
Model E (final model) Adjusting for variables in model D and interaction variables	0.89	0.74-1.06
Sensitivity analysis	0.89	0.73-1.08

e-Table 4. Multivariate analysis of risk factors associated with prolonged IMV (>96 hrs) among IMV patients.

	Odds ratio	95% confidence interval
Morbid Obesity	0.98	0.78-1.23
Age group		
18-34	Reference	
35-49	1.18	1.15-1.21
50-64	1.27	1.15-1.31
65-79	1.14	1.11-1.16
Gender*		
Male	Reference	
Female	1.00	0.99-1.01
Race		
White	Reference	
Black	1.15	1.13-1.17
Hispanic	1.17	1.14-1.19
Asian	1.06	1.01-1.11
Hospital Teaching Status		
Non-Teaching	Reference	
Teaching	1.31	1.29-1.32
Hospital Bed Size		
Small	Reference	
Medium	0.92	0.91-0.94
Large	1.00	0.98-1.01
Charlson-Deyo's Co-morbidity index		
0	Reference	
1-3	1.03	1.01-1.04
4-6	0.92	0.90-0.94
≥7	0.91	0.89-0.93
Number of organ failures		
0	Reference	
1	1.31	1.29-1.32
2	1.46	1.43-1.48
3	1.48	1.45-1.51
4	1.48	1.42-1.53
5	1.48	1.37-1.58
Year		
2004	Reference	
2005	1.00	0.99-1.02
2006	0.98	0.96-1.00
2007	0.90	0.88-0.91
2008	0.86	0.87-0.89

e-Table 5. Multivariate analysis of risk factors associated with tracheostomy among IMV patients.

	Odds ratio	95% confidence interval
Morbid Obesity	2.19	1.77-2.69
Age group		
18-34	Reference	
35-49	1.07	1.03-1.10
50-64	1.09	1.05-1.12
≥65	0.92	0.88-0.94
Gender*		
Male	Reference	
Female	0.95	0.94-0.97
Race		
White	Reference	
Black	1.16	1.13-1.19
Hispanic	1.11	10.7-1.15
Asian	1.10	1.01-1.18
Hospital Teaching Status		
Non-Teaching	Reference	
Teaching	1.66	1.63-1.68
Hospital Bed Size		
Small	Reference	
Medium	1.35	1.31-1.40
Large	1.61	1.55-1.96
Charlson-Deyo's Co-morbidity index		
0	Reference	
1-3	0.82	0.80-0.83
4-6	0.63	0.61-0.65
≥7	0.68	0.65-0.71
Number of organ failures		
0	Reference	
1	1.05	1.03-1.07
2	1.01	0.98-1.03
3	0.90	0.86-0.93
4	0.73	0.69-0.78
5 or 6	0.63	0.55-0.71
Year		
2004	Reference	
2005	0.96	0.94-0.99
2006	0.94	0.92-0.97
2007	0.93	0.91-0.95
2008	0.88	0.85-0.90

e-Table 6. Multivariate analysis of risk factors associated with discharge to home among IMV patients.

	Odds ratio	95% confidence interval
Morbid Obesity	1.10	0.87-1.38
Age group		
18-34	Reference	
35-49	0.84	0.81-0.85
50-64	0.62	0.60-0.63
≥65	0.30	0.29-0.31
Gender*		
Male	Reference	
Female	0.84	0.82-0.85
Race		
White	Reference	
Black	1.18	1.16-1.21
Hispanic	1.48	1.44-1.52
Asian	1.55	1.45-1.65
Insurance status		
Medicare	Reference	
Medicaid	1.29	1.25-1.31
Private	1.42	1.39-1.45
Uninsured	2.72	2.64-2.79
Hospital Teaching Status		
Non-Teaching	Reference	
Teaching	1.14	1.13-1.15
Hospital Bed Size		
Small	Reference	
Medium	1.43	1.40-1.47
Large	1.42	1.39-1.45
Charlson-Deyo's Co-morbidity index		
0	Reference	
1-3	0.99	0.98-1.01
4-6	0.96	0.93-0.98
≥7	0.75	0.72-0.78
Number of organ failures		
0	Reference	
1	0.81	0.80-0.82
2	0.73	0.71-0.74
3	0.71	0.68-0.74
4	0.63	0.58-0.67
5 or 6	0.66	0.56-0.78

e-Table 7. Multivariate analysis of risk factors associated with discharge to nursing home among IMV patients.

	Odds ratio	95% confidence interval
Morbid Obesity	0.74	0.56-0.99
Age group		
18-34	Reference	
35-49	1.13	1.09-1.15
50-64	1.44	1.41-1.48
≥65	2.81	2.74-2.89
Gender*		
Male	Reference	
Female	1.16	1.14-1.17
Race		
White	Reference	
Black	0.92	0.90-0.94
Hispanic	0.75	0.73-0.77
Asian	0.67	0.63-0.72
Insurance status		
Medicare	Reference	
Medicaid	0.80	0.78-0.82
Private	0.68	0.67-0.69
Uninsured	0.37	0.36-0.38
Hospital Teaching Status		
Non-Teaching	Reference	
Teaching	1.16	1.14-1.17
Hospital Bed Size		
Small	Reference	
Medium	0.95	0.92-0.96
Large	1.00	0.99-1.02
Charlson-Deyo's Co-morbidity index		
0	Reference	
1-3	0.87	0.85-0.88
4-6	0.82	0.80-0.84
≥7	0.80	0.78-0.84
Number of organ failures		
0	Reference	
1	1.20	1.18-1.22
2	1.28	1.26-1.31
3	1.30	1.25-1.34
4	1.34	1.26-1.42
5 or 6	1.35	1.17-1.54

e-Table 8. Multivariate analysis of risk factors associated with discharge to home with health care among IMV patients.

	Odds ratio (95% confidence interval)	p-value
Morbid Obesity	1.51	1.12-2.04
Age group		
18-34	Reference	
35-49	1.36	1.31-1.42
50-64	1.72	1.65-1.79
≥65	1.60	1.53-1.67
Gender*		
Male	Reference	
Female	1.09	1.08-1.11
Race		
White	Reference	
Black	0.92	0.90-0.96
Hispanic	0.98	0.95-1.02
Asian	1.02	0.94-1.11
Hospital Teaching Status		
Non-Teaching	Reference	
Teaching	1.07	1.05-1.09
Hospital Bed Size		
Small	Reference	
Medium	1.13	1.09-1.16
Large	1.34	1.30-1.38
Charlson-Deyo's Co-morbidity index		
0	Reference	
1-3	1.27	1.24-1.30
4-6	1.49	1.44-1.54
≥7	2.20	2.11-2.29
Number of organ failures		
0	Reference	
1	0.97	0.96-0.99
2	0.95	0.92-0.97
3	0.94	0.90-0.98
4	0.89	0.82-0.97
5 or 6	0.84	0.69-1.03