

SUPPLEMENTAL MATERIAL

Prognosis of Chronically Ventilated Patients in a Long-Term Ventilation Facility: Association with Age, Consciousness and Cognitive State

Stein D, Sviri S, Beil M, Stav I, Marcus EL

J Intensive Care Med. doi: 10.1177/08850666221088800.

Additional study variables

We retrieved a ‘residence before acute hospital stay’ variable under three subtypes: Community/Home, Nursing Home/Closed Psychiatric Ward and Geriatric Hospital/long-term Ward in the acute care hospital. Place of intubation was recorded through the following five categories: Community-based institutions, Home, Emergency room (ER), Intensive care unit (ICU)/Operating Room (OR) and Ward.

Up to five chronic conditions were collected for each participant as this was the maximum number of chronic conditions in our cohort. We defined 17 chronic conditions i.e., Diabetes Mellitus (DM), Ischemic Heart Disease (IHD), Congestive Heart Failure (CHF), Stroke/CNS Tumors, Dementia, Chronic Kidney Disease (CKD), Neuromuscular disease (Parkinson, Multiple Sclerosis, Amyotrophic Lateral Sclerosis, Cerebral Palsy and Chronic Inflammatory Demyelinating Polyneuropathy), Chronic Obstructive Pulmonary Disease (COPD), Chronic Restrictive Lung disease, Active Hemato-Oncology disease, Chronic Liver disease, Auto-immune/Rheumatic disease, Intellectual Disability, Traumatic Brain Injury (TBI), Psychiatric disease, Alcohol/Drug abuse and Others.

We defined two variables: ‘acute condition leading to acute care hospital (ACH) admission’ and ‘main reason for ventilation’. The former was categorized with the following, Pneumonia /Respiratory infection (aspiration), Other pulmonary, Sepsis /Severe infection, Exacerbation or end-stage chronic lung disease (Chronic obstructive pulmonary disease (COPD), restrictive lung disease), Acute coronary syndrome (ACS)/Congestive Heart Failure (Pulmonary emboli included), Post-Cardio-pulmonary resuscitation (CPR)/anoxia, Acute/Progressive neuromuscular, Acute neurological event (i.e., ischemic stroke, epileptic seizure, intra-cerebral hemorrhage), Head Trauma/other trauma, Postoperative: orthopedic, Postoperative: cardiothoracic, Postoperative: abdominal and others, Gastro-intestinal hemorrhage, Encephalopathy and Others, and the latter were grouped into the following categories:

Pneumonia/ Other Acute Pulmonary Condition; Exacerbation or End-Stage Chronic Lung Disease; Sepsis or septic shock; Cardiac decompensation: Acute coronary syndrome/ Congestive Heart Failure; Post-Cardio-Pulmonary Resuscitation (CPR)/Anoxic Brain Damage; Acute Neurological Event; Acute/Progressive Neuromuscular Condition; Postoperative and Other.

In subjects admitted in vegetative state/ minimally conscious state we aggregated all categories as presenting some form of anoxic brain damage apart from Acute/Progressive neuromuscular, Acute neurological event and traumatic brain injury (TBI).

Also, ICU admission at ACH was recorded in a binary fashion (Yes/No) and when at LTACH, the number of transfers to ER and the number of admissions to ACH were recorded.

Supplemental Table 1. Main Reasons Leading to Chronic Mechanical Ventilation According to Age Groups.

	Total	40-59	60-79	≥ 80	<i>P</i> *
	(n=308)	(n=36)	(n=146)	(n=126)	
Main Reason for Ventilation, n (%)					.486
Pneumonia/ Other Acute Pulmonary Condition	92 (29.9)	9 (25.0)	36 (24.7)	47 (37.3)	
Sepsis or septic shock	26 (8.4)	4 (11.1)	15 (10.3)	7 (5.6)	
Exacerbation or End-Stage Chronic Lung Disease	31 (10.1)	3 (8.3)	15 (10.3)	7 (5.6)	
Acute Coronary Syndrome/ Congestive Heart Failure	7 (2.3)	0 (0)	4 (2.7)	3 (2.4)	
Post-Cardiopulmonary Resuscitation/ Anoxic Brain Damage	82 (26.6)	12 (33.3)	41 (28.1)	29 (23.0)	
Acute/ Progressive Neuromuscular Condition	11 (3.6)	2 (5.6)	8 (5.5)	1 (0.8)	
Acute Neurological Event	28 (9.1)	4 (11.1)	11 (7.5)	13 (10.3)	
Postoperative	21 (6.8)	1 (2.8)	12 (8.2)	8 (6.3)	
Other	10 (3.2)	1 (2.8)	4 (2.7)	5 (4.0)	

**P* value refers to the difference between age groups.

Supplemental Table 2. Consciousness and Cognitive State at Three Time Points According to Age Groups.

	Total	40-59	60-79	≥ 80	<i>P</i> *
	(n=308)	(n=36)	(n=146)	(n=126)	
Consciousness and Cognitive State Prior to the Event, n (%)					<.001
VS/MCS	4 (1.3)	0 (0)	4 (2.7)	0 (0)	
SCI	71 (23.1)	4 (11.1)	19 (13.0)	48 (38.1)	
Mild/Moderate Cognitive Impairment	57 (18.5)	4 (11.1)	19 (13.0)	34 (27.0)	
No Cognitive Impairment	162 (52.6)	22 (61.1)	96 (65.8)	44 (34.9)	
Intellectual Disability/Psychiatric Disorder	14 (4.5)	6 (16.7)	8 (5.5)	0 (0)	
Consciousness and Cognitive State at Admission to LTACH, n (%)					<.001
VS/MCS	130 (42.2)	19 (52.8)	68 (46.6)	43 (34.1)	
SCI	100 (32.5)	4 (11.1)	27 (18.5)	69 (54.8)	
Mild/Moderate Cognitive Impairment	34 (11.0)	2 (5.6)	19 (13.0)	13 (10.3)	
No Cognitive Impairment	38 (12.3)	8 (22.2)	29 (19.9)	1 (0.8)	
Intellectual Disability/Psychiatric Disorder	6 (1.9)	3 (8.3)	3 (2.1)	0 (0)	
Consciousness and Cognitive State at the End of Follow-Up, n (%)					<.001
VS/MCS	126 (40.9)	18 (50.0)	69 (47.3)	39 (31.0)	
SCI	110 (35.7)	5 (13.9)	32 (21.9)	73 (57.9)	
Mild/Moderate Cognitive Impairment	32 (10.4)	2 (5.6)	18 (12.3)	12 (9.5)	
No Cognitive Impairment	35 (11.4)	8 (22.2)	25 (17.1)	2 (1.6)	

Intellectual Disability/Psychiatric Disorder	5 (1.6)	3 (8.3)	2 (1.4)	0 (0)
--	---------	---------	---------	-------

LTACH = long-term acute care hospital; SCI = severe cognitive impairment; VS/MCS = vegetative state/minimally conscious state.

* *P* values refer to differences between age groups.

Supplemental Table 3. Ventilation and Weaning Outcomes at Two Time Points According to Age Groups.

	Total	40-59	60-79	≥ 80	<i>P</i> *
	(n=308)	(n=36)	(n=146)	(n=126)	
Daily Ventilation Time at Admission to LTACH, n (%)					.21
24 hours	286 (93.5)	33 (91.7)	131 (91.0)	122 (96.8)	
20-23 hours	2 (0.7)	0 (0.0)	2 (1.4)	0 (0.0)	
8-19 hours	4 (1.3)	0 (0.0)	2 (1.4)	2 (1.6)	
Nocturnal ventilation	14 (4.6)	3 (8.3)	9 (6.3)	2 (1.6)	
Daily Ventilation Time at the End of Follow-Up, n (%)					.02
24 hours	255 (83.3)	27 (75.0)	115 (79.9)	113 (89.7)	
20-23 hours	3 (1.0)	1 (2.8)	2 (1.4)	0 (0.0)	
8-19 hours	9 (2.9)	0 (0.0)	4 (2.8)	5 (4.0)	
Nocturnal Ventilation	25 (8.2)	4 (11.1)	17 (11.8)	4 (3.2)	
Weaned	14 (4.6)	4 (11.1)	6 (4.2)	4 (3.2)	

* *P* values refer to differences between age groups.

Supplemental Table 4. Main Reasons for Ventilation According to Consciousness and Cognitive State at Admission to LTACH.

Main Reasons for Ventilation	Consciousness and Cognitive State at Admission to LTACH					Total, n (%)
	VS/MCS	SCI	Mild/Moderate Cognitive Impairment	No Cognitive Impairment	Intellectual Disability/Psychiatric Disorder	
Pneumonia/ Other Acute Pulmonary Condition, n (%)	24 (18.5)	44 (44.0)	10 (29.4)	9 (23.7)	5 (83.3)	92 (29.9)
Sepsis or septic shock, n (%)	9 (6.9)	12 (12.0)	1 (2.9)	4 (10.5)	0 (0)	26 (8.4)
Exacerbation or End-Stage Chronic Lung Disease, n (%)	6 (4.6)	11 (11.0)	8 (23.5)	6 (15.8)	0 (0)	31 (10.1)
Acute Coronary Syndrome / Congestive Heart Failure, n (%)	3 (2.3)	2 (2.0)	1 (2.9)	1 (2.6)	0 (0)	7 (2.3)
Post-Cardiopulmonary Resuscitation/ Anoxic Brain Damage, n (%)	59 (45.4)	16 (16.0)	4 (11.8)	2 (5.3)	1 (16.7)	82 (26.6)
Acute/ Progressive Neuromuscular Condition, n (%)	1 (0.8)	1 (1.0)	3 (8.8)	6 (15.8)	0 (0)	11 (3.6)
Acute Neurological Event, n (%)	19 (14.6)	4 (4.0)	1 (2.9)	4 (10.5)	0 (0)	28 (9.1)
Postoperative, n (%)	4 (3.1)	6 (6.0)	6 (17.6)	5 (13.2)	0 (0)	21 (6.8)
Other, n (%)	5 (3.8)	4 (4.0)	0 (0)	1 (2.6)	0 (0)	10 (3.2)
Total at Admission to LTACH, n (%)	130 (42.2)	100 (32.5)	34 (11.0)	38 (12.3)	6 (1.9)	308 (100)
<i>P</i> *						<.001

LTACH = long-term acute care hospital; SCI = severe cognitive impairment; VS/MCS = vegetative state/minimally conscious state.

**P* value refers to the difference between the various consciousness and cognitive states at admission to LTACH.

Supplemental Table 5. Association Between Consciousness and Cognitive State at Admission to LTACH and Weaning Outcome.

	Status of Ventilation at the End of Follow-Up		<i>P</i> *
	Weaned	Ventilated	
Consciousness and Cognitive State at Admission to LTACH, n (%)			<.001
VS/MCS	1 (0.8)	128 (99.2)	
SCI	3 (3.0)	97 (97.0)	
Mild/Moderate Impairment	1 (3.0)	32 (97.0)	
No Cognitive Impairment	9 (23.7)	29 (76.3)	
Intellectual Disability/Psychiatric Disorder	0 (0.0)	6 (100.0)	
Total (n = 306)	14 (4.6)	292 (95.4)	

LTACH = long-term acute care hospital; SCI = severe cognitive impairment; VS/MCS = vegetative state/minimally conscious state.

* *P* value refers to the difference between the various consciousness and cognitive states at admission to LTACH.

Supplemental Table 6. Association between Consciousness and Cognitive State at Admission to LTACH and Location at the End of Follow-Up.

Consciousness and Cognitive State at Admission to LTACH, n (%)	Patient Location at the End of Follow-Up				<i>P</i> *
	LTACH	Home	Acute Hospital	Complex Nursing Department/Rehabilitation Department	
VS/MCS	36 (60.0)	0 (0.0)	24 (40.0)	0 (0.0)	<.001
SCI	22(42.3)	5(9.6)	24 (46.2)	1 (1.9)	
Mild/Moderate Impairment	3 (14.3)	5 (23.8)	11 (52.4)	2 (9.5)	
No Cognitive Impairment	13 (41.9)	7 (22.6)	7 (22.6)	4 (12.9)	
Intellectual Disability/Psychiatric Disorder	4 (100)	0 (0.0)	0 (0.0)	0 (0.0)	
Total (n = 168)	78 (46.4)	17(10.1)	66 (39.3)	7 (4.2)	

LTACH = long-term acute care hospital; SCI = severe cognitive impairment; VS/MCS = vegetative state/minimally conscious state.

* *P* value refers to the difference between the various consciousness and cognitive states at admission to LTACH.

Supplemental Table 7. Correlated Proportions Between Consciousness and Cognitive State prior to the Event and at admission to LTACH.

Consciousness and Cognitive State at Admission to LTACH						
Consciousness and Cognitive State Prior to the Event	VS/MCS	SCI	Mild/Moderate Cognitive Impairment	No Cognitive Impairment	Intellectual Disability/Psychiatric Disorder	Total Prior to the Event, n (%)
VS/MCS, n (%)	4 (1.3)	0 (0)	0 (0)	0 (0)	0 (0)	4 (1.3)
SCI, n (%)	13 (4.2)	58 (18.8)	0 (0)	0 (0)	0 (0)	71 (23.1)
Mild/Moderate Cognitive Impairment, n (%)	22 (7.1)	22 (7.1)	13 (4.2)	0 (0)	0 (0)	57 (18.5)
No cognitive Impairment, n (%)	84 (27.3)	19 (6.2)	21 (6.8)	38 (12.3)	0 (0)	162 (52.6)
Intellectual Disability/Psychiatric Disorder, n (%)	7 (2.3)	1 (0.3)	0 (0)	0 (0)	6 (1.9)	14 (4.5)
Total at Admission to LTACH, n (%)	130 (42.2)	100 (32.5)	34 (11.0)	38 (12.3)	6 (1.9)	308 (100)
<i>P</i>						<.001

LTACH = long-term acute care hospital; SCI = severe cognitive impairment; VS/MCS = vegetative state/minimally conscious state.

Supplemental Table 8. Correlated Proportions Between Consciousness and Cognitive State at Admission to LTACH and at the End of Follow-Up.

Consciousness and Cognitive State at the End of Follow-Up						
Consciousness and Cognitive State at Admission to LTACH	VS/MCS	SCI	Mild/Moderate Cognitive Impairment	No Cognitive Impairment	Intellectual Disability/Psychiatric Disorder	Total at Admission to LTACH, n (%)
VS/MCS, n (%)	120 (39.0)	9 (2.9)	1 (0.3)	0 (0)	0 (0)	130 (42.2)
SCI, n (%)	3 (1.0)	92 (29.9)	5 (1.6)	0 (0)	0 (0)	100 (32.5)
Mild/Moderate Cognitive Impairment, n (%)	1 (0.3)	7 (2.3)	24 (7.8)	2 (0.6)	0 (0)	34 (11.0)
No Cognitive Impairment, n (%)	2 (0.6)	1 (0.3)	2 (0.6)	33 (10.7)	0 (0)	38 (12.3)
Intellectual Disability/Psychiatric Disorder, n (%)	0 (0)	1 (0.3)	0 (0)	0 (0)	5 (1.6)	6 (1.9)
Total at the End of Follow-Up, n (%)	126 (40.9)	110 (35.7)	32 (10.4)	35 (11.4)	5 (1.6)	308 (100)
<i>P</i>						.395

LTACH = long-term acute care hospital; SCI = severe cognitive impairment; VS/MCS = vegetative state/minimally conscious state.