ROLE OF LONG TERM ACUTE CARE (LTSC)

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Samuel Hammerman, MD, MMM, CPE, FCCP is senior vice president, chief medical officer for Select Medical's Critical Illness Recovery Hospital Division and chief quality officer for the company. Over the past five years he has led initiatives with the clinical and quality teams to reduce hospital-acquired conditions including: pressure injuries, Clostridium Difficile (C. Diff.), Catheter Associated Urinary Tract Infections (CAUTI) and Central Line-Associated Blood Stream Infections (CLABSI). He has also recently led efforts with the corporate quality team to attain regional Baldrige recognition at Select Medical, now actively seeking the national honor. A practicing pulmonary and critical care physician, he is an assistant professor at Penn State University School of Medicine in the Pulmonary, Allergy, and Critical Care Medicine division. Before joining Select Medical in 2013, he was director of pulmonary and critical care medicine for Geisinger Health System in the Northeast region.

Dr. Hammerman received his undergraduate degree at the University of Maryland. He earned his medical degree from the Medical University of South Carolina. He completed his residency and chief residency at the University of Pittsburgh Medical Center and a postdoctoral fellowship in pulmonary and critical care medicine at Boston University Medical Center where his research was focused on deriving the pathophysiological mechanisms of sickle cell lung disease. He completed a postdoctoral fellowship in pulmonary and critical care medicine at Boston University Medical Center where his research was focused on deriving the pathophysiological mechanisms of sickle cell lung disease. He earned his master’s degree in medical management from Carnegie Mellon University.

Dr. Hammerman enjoys cycling, lacrosse, and spending time with family and 2 havanese. He now resides in Mechanicsburg, PA.

OBJECTIVES:

1. Understand the role of LTACs in the critical care continuum
2. Recognize the evolving demographics of CCI and PMV patient populations
3. Further develop a clinical construct that addresses the definition of PMV and CCI
Role of Long Term Acute Care (LTAC)

SAMUEL I. HAMMERMAN, MD, MMM, CPE, FCCP
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Chief Quality Officer, Select Medical
and
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Pennsylvania State University College of Medicine, Milton S. Hershey Medical Center
Objectives

01. Understand the role of LTACs in the critical care continuum
02. Recognize the evolving demographics of CCI and PMV patient populations
03. Further develop a clinical construct that addresses the definition of prolonged mechanical ventilation and CCI

Agenda

01. A brief history of the LTAC space
02. The regulatory landscape
03. Defining the patient population
04. Clinical approaches
05. Outcomes
06. Proposing a framework for consensus guidelines
Prevalence of Research Publications

<table>
<thead>
<tr>
<th>Condition</th>
<th># of publications 1998 - 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic Critical Illness</td>
<td>146</td>
</tr>
<tr>
<td>Prolonged Mechanical Ventilation</td>
<td>1,358</td>
</tr>
<tr>
<td>Acute Respiratory Distress Syndrome or ARDS</td>
<td>12,697</td>
</tr>
</tbody>
</table>
Evolution of Long-Term Acute Care Hospitals

The long-term acute care hospital (LTAC) evolved from tuberculosis sanatoriums and polio hospitals. These centers cared for patients with complex medical needs, particularly long-term respiratory illnesses, that required extended length of stay in the hospital.\(^1\)

Federal regulations in the 1980s defined LTACs only by length of stay of \(>25\) or \(>30\) days\(^2,3\).

Today’s LTACs care for critically ill patients needing long-term, high-level care for complex conditions, particularly:

- Prolonged mechanical ventilation
- Chronic critical illness

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Medicare Post-Acute Care

<table>
<thead>
<tr>
<th>Type</th>
<th>Total Annual Medicare Spending</th>
<th>Facilities</th>
<th>Medicare Pays</th>
<th>Medicaid Pays</th>
</tr>
</thead>
<tbody>
<tr>
<td>HHA</td>
<td>$19 B Per Year</td>
<td>~12,000</td>
<td></td>
<td>$5-10 B</td>
</tr>
<tr>
<td>SNF</td>
<td>$31 B Per Year</td>
<td>~15,000</td>
<td></td>
<td>$30 B</td>
</tr>
<tr>
<td>IRF</td>
<td>$7.5 B Per Year</td>
<td>~1,200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LTAC</td>
<td>$4.7 B Per Year</td>
<td>~500</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Medicare Pays

Medicaid pays another $5-10 B

Medicaid pays another $30 B
LTAC Share of Post-Acute Care

Social Security Amendment of 1983
- IPPS implemented for STACHs
- LTACs - remain on Cost-based Reimbursement
- Introduced Greater than 25 Day ALOS Rule

1983

Cost-based reimbursement with caps on the Average Cost per Discharge
- Congress directs Medicare to develop PPS for LTACs, IRFs, SNF, HHA

1997

CMS implements PPS for LTACs
- Moratorium on new LTACs, new LTAC satellites and new LTAC beds begins

2003

2007

LTAC criteria implementation; establishment of "site-neutral" payments for LTACs
- Congress extends the Site-Neutral payment period until September 30, 2019

2016

2018

Medicare Payment Criteria for LTACs: Dual-Rate Payment Structure

To be eligible for Full LTAC PPS, a patient must have had:

1. **3 or more days** in a acute care hospital ICU/CCU immediately preceding admission to the LTAC, or
2. **96 or greater hours** on mechanical ventilation while in the LTAC with a acute care hospital stay immediately preceding admission to the LTAC
3. and, cannot have a primary diagnosis of either a psychiatric condition or need for intensive rehabilitation, irrespective of the patient’s ICU or ventilator status

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LTAC Criteria: Impacts

- MedPAC analyses from 2018 indicate facilities have made operational changes in response to criteria
- LTAC patient acuity has increased
- Additional ICU-level nursing capacity, greater investment in staff training necessary
- Closure of LTAC facilities: over 40 LTACs have closed (10% of industry)

![Figure 14: Decline in the National Number of LTCHs from 2012 through 2017](source)
A Changing Patient Population

01
A proliferation of chronic conditions

02
Advances in life-sustaining technologies

03
A more severe population of ICU patients and LTAC patients

Defining the Patient Population

Persistent inflammation, immunosuppression, and catabolism syndrome (PICS)

Chronic Critical Illness

Persistent Critical Illness

Prolonged ICU Stays
Which of the following statements best characterizes patients with CCI?

A) Always requires prolonged mechanical ventilation
B) Requires a minimum of 5 days in the ICU
C) Can be readily defined at hospital admission
D) Various studies have yet to establish a consensus definition of CCI

Question 1 (Hammerman): Which of the following statements best characterizes patients with CCI:

A. Always requires prolonged mechanical ventilation
B. Requires a minimum of 5 days in the ICU
C. Can be readily defined at hospital admission
D. Various studies have yet to establish a consensus definition of CCI
Definitions of Chronic Critical Illness
Clareen Wiencek, RN, PhD, CNP, Chris Winkelman, RN, PhD, CNP

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zilberberg et al.</td>
<td>Prolonged acute mechanical ventilation of ≥96 h</td>
</tr>
<tr>
<td>Schuhmacher et al.</td>
<td>Prolonged ventilator-dependent respiratory failure</td>
</tr>
<tr>
<td>MacIntyre et al.</td>
<td>Prolonged mechanical ventilation is the need for mechanical ventilation for 21 consecutive d and ≥6 h/d</td>
</tr>
<tr>
<td>Daly et al.</td>
<td>Patients requiring mechanical ventilation for ≥72 h who survive to discharge from the index hospitalization</td>
</tr>
<tr>
<td>Nelson et al.</td>
<td>A syndrome of significant derangements of metabolism and of neuroendocrine, neuropsychiatric, and immunologic functions defined by performance of tracheotomy for failure to wean from mechanical ventilation</td>
</tr>
<tr>
<td>Nierman</td>
<td>Patients who survive a critical illness but are left with significant functional impairments and dependency on intense nursing care and advanced technology</td>
</tr>
<tr>
<td>Carson and Bach</td>
<td>Patients who require continued care and prolonged mechanical ventilation in an ICU for weeks to months; 21-d ICU stay indicator that most easily reversible conditions have been addressed</td>
</tr>
<tr>
<td>Nascaway et al.</td>
<td>A small subset of the ICU patients who because of underlying illness or complications suffer a prolonged and complicated ICU course; severely weakened survivors of acute illness often ventilator-dependent or renal dialysis-dependent</td>
</tr>
<tr>
<td>Douglas et al.</td>
<td>Patients who require long-term ventilation and intensive nursing care after receiving medical therapy for primary disease; generally ICU stay of &gt;2 wk</td>
</tr>
<tr>
<td>Girard and Raffin</td>
<td>ICU patients who do not survive despite extraordinary life support for weeks to months</td>
</tr>
</tbody>
</table>


Conditions Requiring Long ICU Stay

- **Neurologic**
  - Guillain-Barre, acute paralysis, myasthenia gravis, TBI

- **Pulmonary**
  - COPD, exacerbations in baseline function

- **Inflammatory**
  - Severe acute pancreatitis, undrainable infections

- **Complex Medical**
  - Burns, wound care, prolonged withdrawal syndromes

- **Unrecoverable Illness**
  - Relapsed liquid tumor despite transplant attempts, chronic or acute

Persistent Critical Illness

- Remaining in the ICU is not simply attributed to PMV, failure to heal, or system failures
- 78% of patients developed new organ failure on or after day 4 of ICU stay
- Around ICU day 10, the patient’s admitting illness is no longer the cause for continued ICU stay, but a cascade of new critical illness that has developed


Persistent Critical Illness

Acute Characteristics
- ICU Admission Diagnosis
- ICU Admission Physiologic
- RRT in 24 hours Prior to ICU
- Cardiac Arrest Prior to ICU
- Time Awaiting ICU Bed

Antecedent Characteristics
- Age
- Demographics (sparse here)
- Comorbidities
- Hospital Characteristics
- Time of Year

Figure 3: Predictiveness of severity of illness at ICU admission and antecedent characteristics for hospital mortality in the validation cohort
Population Growth

Even as severity of illness and prevalence of mechanical ventilation has been increasing in the ICU, mortality has been decreasing.

- Between 7 and 11% of ICU admissions meet the definition of chronic critical illness.
- Patients with chronic critical illness account for 32.8% of all ICU bed days.

![Graph showing decrease in mortality from 2004 to 2009.](image)

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Advances in Life-Sustaining Technology

Projected growth of population requiring prolonged mechanical ventilation

![Graph showing projected growth of population requiring prolonged mechanical ventilation.](image)

Total cost of care for prolonged acute mechanical ventilation patients is expected to reach nearly $60 billion in 2020.

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Audience Participation

**What is the current consensus definition of prolonged mechanical ventilation?**

A) 21 days  
B) 96 hours  
C) 14 days  
D) Up to physician interpretation based on patient’s clinical course

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**Question 2 (Hammerman): What is the current consensus definition of prolonged mechanical ventilation?**

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>21 days</td>
</tr>
<tr>
<td>B.</td>
<td>96 hours</td>
</tr>
<tr>
<td>C.</td>
<td>14 days</td>
</tr>
<tr>
<td>D.</td>
<td>Up to physician interpretation based on patient’s clinical course</td>
</tr>
</tbody>
</table>
PMV in the Literature

- A recent meta-analysis of PMV studies identified the use of 37 different durations of ventilation.
- Of 419 studies, 53 (12.6%) used ≥ 21 days to 1 month.

<table>
<thead>
<tr>
<th>Organization</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Association for Medical Direction of Respirator Care (NAMDRC)</td>
<td>“the need for more than 21 consecutive days of MV for more than 6 h/day”</td>
</tr>
<tr>
<td>European Respiratory Society (ERS) Task Force</td>
<td>“the need for more than 7 days of weaning after the first spontaneous breathing trial (SBT)”</td>
</tr>
<tr>
<td>Weaning according to New Definition (WIND) study</td>
<td>“successful extubation after more than three SBTs or taking more than seven days”</td>
</tr>
</tbody>
</table>


Defining PMV

Lack of consensus for defining PMV with a static length of time indicates that transition from acute to PMV depends on:

1) Many underlying clinical factors
2) Variable patient characteristics
3) The sensitivity of the outcomes under evaluation to physiologic processes that are changing within the ventilated patient
MCG Health’s Indicators for Admission use ≥ 21 days as a threshold to define prolonged mechanical ventilation (despite the lack of consensus in the literature).

Implications on ICU Bed Occupancy and Mortality

Impact of Delayed Transfer of Critically Ill Patients from the Emergency Department to the Intensive Care Unit

<table>
<thead>
<tr>
<th>Transfer of Hospital Survivors</th>
<th>Median Hospital LOS</th>
<th>ICU mortality</th>
<th>In-hospital mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delayed</td>
<td>7.0**</td>
<td>10.7%*</td>
<td>17.4%**</td>
</tr>
<tr>
<td>Non-delayed</td>
<td>6.0</td>
<td>8.4%</td>
<td>12.9%</td>
</tr>
</tbody>
</table>

** > .001, * > .01

• Critically ill ER patients with a ≥ 6 hour delay in ICU transfer
  — Had increased hospital LOS
  — Had higher ICU and hospital mortality

• Conclusion
  — There is a “need to identify factors associated with delayed transfer as well as specific determinants of adverse outcomes”

Long-Stay ICU Patients

<table>
<thead>
<tr>
<th>Hospital Outcome</th>
<th>10 or Fewer Days</th>
<th>More than 10 Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death</td>
<td>90,323 (9.2%)</td>
<td>12,625 (24.5%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Discharge to:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Home</td>
<td>758,552 (77.7%)</td>
</tr>
<tr>
<td>Rehabilitation or long-term care</td>
<td>68,584 (7.0%)</td>
</tr>
<tr>
<td>Other hospital</td>
<td>59,267 (6.1%)</td>
</tr>
</tbody>
</table>

Nearly half of patients in ICU after 10 days will not go directly home from the hospital.

Differentiating Venues of Post-ICU Care

<table>
<thead>
<tr>
<th>Level of Care</th>
<th>Acuity Level</th>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTAC</td>
<td>Patients may be unstable as long as acute care interventions not needed</td>
<td>Clinical Team and Patient Focused Lower cost Physician Coverage Patient focused</td>
<td>Some focused interventions available (GI procedures, debridements, Respiratory procedures, basic diagnostics)</td>
</tr>
<tr>
<td>Sub-acute SNF</td>
<td>Patients must be stable</td>
<td>Cost Family access Patient focused</td>
<td>No on-site interventions, ratios much lower No daily physician coverage</td>
</tr>
<tr>
<td>SNF</td>
<td>Patients must be stable and recovering</td>
<td>Cost</td>
<td>Staffing ratios No on-site interventions No daily physician coverage</td>
</tr>
<tr>
<td>Acute Rehabilitation</td>
<td>Must be stable and able to meet rehab criteria</td>
<td>Rehab and mobility focused</td>
<td>CCIS pt often not ready for this level</td>
</tr>
</tbody>
</table>


Clinical Pathways

Clinical issues: CCI

Clinical approaches and innovations

Liberate from Ventilator:
- Use protocol-drive approach to weaning and decannulation
- Involve non-physician staff

Provide Nutritional Support:
- Use enteral route preferentially
- Give metabolic substrate without overfeeding
- Consider Vitamin D and bisphosphonate therapy

Optimize Function and Cognition:
- Initiate physical therapy early
- Minimize use of deliriogenic medications

Integrate Palliative Care with Restorative Treatment:
- Treat distressing symptoms
- Communicate about care goals
- Plan for transition from hospital

Prevent Infection and Other Complications:
- Systematize processes for handwashing, isolation, catheter management, protection of skin integrity

Dedicated Interdisciplinary Team:
- Physicians, Nurses, Social Workers, Respiratory and Physical Therapists, Nutritionists

LTAC Mobility


Outcomes

One-year trajectories of care and resource utilization for recipients of prolonged mechanical ventilation: a cohort study
Unroe M, Kahn JM, Carson SS, Govert JA, et al.

- 1-year, prospective cohort study of Duke University Medical Center adult ICU patients
- 126 patients and their surrogates:
  - enrolled in April 2006
  - follow-up concluded in April 2008
- Eligible patients met either one of 2 definitions of PMV:
  - Mechanical ventilation for ≥21 days w/ less than 48 hours of unassisted breathing
  - 4 or more days of ventilation and placement of a tracheostomy
STACH inpatients (n=202,948)

LTAC admission criteria: ventilator dependence, complex respiratory issues, complex wounds

Met LTAC Admission Criteria (n=56,910)

Did not meet LTAC Admission Criteria (n=146,038)

Clinically Similar Patients Different Care Paths

Admitted to LTAC (n=32,409)

Not Admitted to LTAC (n=24,501)

Mortality in Clinically Equivalent LTACH Patient Populations

All STACH inpatients evaluated by 38 SM LTACs in 9 states: 1/31/2011 – 1/31/2015

"LTACs might improve survival for patients when the population of eligible patients is expanded to include those earlier in their ICU course."

"Our study provides important conceptual support for the LTAC model in chronic critical illness."
Timing of Transition

- In the state of Maryland, state subcontractors evaluate long-term acute ventilator unit patients for transfer to skilled ventilator facilities based on Maryland’s criteria for chronic level of care.
- Deaths over the time of observation in the LTAC at Johns Hopkins Bayview Medical Center were compared to patients transferred to skilled ventilator units in the Baltimore, MD, region.

“Patients eligible for transfer of care and sent to SNFs had higher mortality rates than those who remained at a higher level of care before being discharged home.”

Follow-up study of all patients discharged from the long-term chronic ventilator units at Johns Hopkins Bayview Medical Center between 2010 and 2012 for up to 5 y post discharge.

“Patients were most likely to be alive after 1 y if they had shorter stays in the ICU and were sent home versus to a SNF.”

<table>
<thead>
<tr>
<th>Survivors vs non-survivors 1 year after LTACH Discharge</th>
<th>Survivors (N=55)</th>
<th>Non-survivors (N=24)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y ± SD</td>
<td>62.6 ± 12.4</td>
<td>70.4 ± 13.1</td>
<td>0.030</td>
</tr>
<tr>
<td>Female, n (%)</td>
<td>29 (53)</td>
<td>13 (54)</td>
<td>0.450</td>
</tr>
<tr>
<td>Sofa score on admission to ICU (± SD)</td>
<td>6.1 ± 1.4</td>
<td>5.6 ± 2.0</td>
<td>0.210</td>
</tr>
<tr>
<td><strong>Length of stay in ICU, d ± SD</strong></td>
<td><strong>10.4 ± 5.0</strong></td>
<td><strong>16.4 ± 11.5</strong></td>
<td><strong>0.031</strong></td>
</tr>
<tr>
<td>Length of stay in LTACH d ± SD</td>
<td>36.1 ± 14.5</td>
<td>44.5 ± 8.8</td>
<td>0.110</td>
</tr>
<tr>
<td>Dicharged home, n (%)</td>
<td>27 (49)</td>
<td>7 (29)</td>
<td>0.040</td>
</tr>
</tbody>
</table>

Galiatsatos et al., Resp Care, In Press, DOI: 10.4187/respcare.05419
Long-term outcome after prolonged mechanical ventilation: a long-term acute care hospital study

Jubran A, Grant BJ, Duffner LA, Collins EG, Lanuza DM, Hoffman LA & Tobin MJ.
Am J Respir Crit Care Med. 2019 Jan 9 [in press].

Figure 1: Proportion of patients alive in the ventilator-detached group and ventilator-attached group. Dotted lines represent 95% confidence intervals.

- Of 315 patients, **53.7% were detached from the ventilator at discharge**
- **1-year survival**
  - Detached at discharge: 66.9%
  - Attached at discharge: 16.4%

Longitudinal data on survival, muscle function, and QOL for MV patients
90-bed freestanding LTAC in the Midwest
Study period 2003-2010

Cumulative mortality over 12 months: 57.1%
Long-term outcome after prolonged mechanical ventilation: a long-term acute care hospital study
Jubran A, Grant BJ, Duffner LA, Collins EG, Lanuza DM, Hoffman LA & Tobin MJ.
Am J Respir Crit Care Med. 2019 Jan 9 [in press].

Discharge to 6 months post
➢ Hand grip strength increased by 165%
➢ P_{max} increased by 27%
➢ SF-36 physical-summary score was 92.0% of score before illness
➢ 78% of patients were able to perform ADLs without assistance
➢ 84.7% of patients said they would be willing to undergo prolonged ventilation again if necessary

Establishing Consensus

"And the vote to have a unanimous consensus passed five to two."
Determinants of Effectiveness in Long-Term Acute Care Hospitals

NIH R01 #5R01HL096651-07

PI: Jeremy Kahn

**Goal**: Develop a framework for LTAC quality that is patient-focused, provider-driven and actionable

**Aim 1**: Develop a conceptual model for LTACH quality through in-depth site visits at selected LTACHs

**Aim 2**: Validate the conceptual model through a national survey of LTACHs

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**Defining Prolonged Mechanical Ventilation**

Is the current NAMDRC definition useful for advancing science or treating patients?

If not, can it be modified or replaced?

Would a new classification of PMV help:

- Clinical care
- Basic and clinical research
- Epidemiology and surveillance
- Quality improvement and audit

A Multistep Consensus Conference Process