Enhancing the Quality of the Pulmonary Patient by Creating a High Dependency Respiratory Care Unit

Michael Becker RN MSN CCRN
Director of Inpatient Professional Services
Temple University Physicians Inc
Temple University Hospital

Temple is a 636-bed teaching hospital providing an array of inpatient and outpatient services to its surrounding community and highly specialized tertiary services to the entire Philadelphia region and beyond. Temple is well known for its expertise in cardiology, pulmonary, sports medicine and gastroenterology and is the chief clinical training site for the Temple University School of Medicine.
TEMPEL UNIVERSITY HOSPITAL

Temple Lung Center

- Named by U.S. News & World Report as one of “America’s Best Hospitals” for Respiratory Disorders.
- Joint Commission on the Accreditation of Healthcare Organizations granted national certification to Temple as a Center for Lung Volume Reduction Surgery (LVRS), a treatment for emphysema. Temple is the first hospital in Philadelphia, and among the first academic hospitals in the nation, to receive the Joint Commission’s Gold Seal of Approval for LVRS.
COPD Facts

- World Health Organization estimates that COPD is the 4th leading cause of death, and projected to be the third leading cause by 2020.
- The WHO estimates that in 2000, 2.74 million people died of COPD worldwide.
- Approximately 12.1 million people in the US are currently diagnosed with COPD in 2001.
- About 24 million adults have evidence of impaired lung function indicating COPD is under diagnosed.
- About 1.5 million ED visits by adults >25 years were made for COPD in 2000.

2001 World Health Organization statistics
The estimated cost of COPD in 2002 was 32.1 billion dollars in direct and indirect costs. 
- $18 million direct costs
- $14.1 million indirect costs

More than 726,000 inpatient hospitalizations for COPD occurred in 2000.
- More females than males were hospitalized for COPD (404,000 vs. 322,000).
Identified Issues

1. Physicians identified a quality of care concern related to the complex respiratory care pt.

2. Clinical data showed:
   - 50% of patients receiving Bi-pap were admitted to non-pulmonary Nursing units.
   - All 12 in-patient medical surgical units had at least 2 bi-pap patients admitted in past year.
   - 60% of admitted patients with acute asthma requiring 2 or more urgent inhaled respiratory treatments within first 12 hours were placed on non-pulmonary units.
   - 40% of admitted patients with primary COPD had no Pulmonary consult.
3. Operational issues:

- Limited respiratory FTE’s limited interventions on floors outside of the pulmonary floor.
- Primary pulmonary service admissions had increased 18% over the past year.
- RICU utilization averaged 86% occupancy for the prior year.
- New patients to Pulmonary practice increased by 38% over the past year.

(Average for every 5 new patients=1 IP admission)
Interventions

- Assemble a Pulmonary team
- Develop a High Dependency Respiratory Care Unit, to care for complex pulmonary patients
- Develop Evidenced based clinical practice guideline
- Educate staff on HDRCU criteria
- Develop policies and procedures
Temple Lung Center
Goals of COPD Management

- Prevent chronic and troublesome symptoms
- Maintain (near) normal lung functions
- Maintain normal activity levels
- Prevent recurrent exacerbations and minimize ED visits or hospitalizations
- Provide optimal pharmacotherapy with minimal or no adverse effects
- Meet and/or exceed patients’ and families’ expectations and satisfaction with care
36 bed high dependency respiratory care unit located on a general medical floor of a tertiary care university urban teaching hospital.

Complex and diverse problems of respiratory failure patients are treated by a team comprised of diverse specialists (pulmonologists, nurses, nutritionists, psychologist, respiratory, physical and speech therapists, social workers and case managers).
Medical staff are Board Certified

Weekly Discharge planning meetings by medical director

All patients have been ventilated for \( \geq 21 \) days for at least 6 hrs/day, require noninvasive ventilation for stabilization of acute on chronic respiratory failure, or require intense respiratory interventions \( (\geq 1 \text{rx/2hrs}) \)

Emphasis is placed on rehabilitation and restoration of functional status.
HDRCU Admission Criteria

Three types of patient populations served on this specialty unit.

- Complicated COPD patients
- Ventilator rehabilitation patients
- Non-invasive positive pressure ventilation patients
Admission Criteria

- **Bi-Pap patients**
  - All patients who require bi-pap therapy, regardless of diagnosis.
  - Stable patients who require bi-pap to stabilize an acute respiratory event

- **Ventilated patients**
  - Patients being actively weaned from ventilator
  - Must have tracheotomy
  - Patient is able to actively participate in PT
  - Patient and family willing to partake in care
  - Patient must be able to actively signal for assistance
**Criteria for Transfer of Ventilator-Dependent Patients From ICU to VRU**

<table>
<thead>
<tr>
<th>Respiratory Stability</th>
<th>Non Respiratory Medically stable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Airway:</strong> Tracheostomy</td>
<td>Sepsis controlled</td>
</tr>
<tr>
<td><strong>Secretions:</strong> Suctioning &lt; every 2 hours</td>
<td>No un-controlled hemorrhage</td>
</tr>
<tr>
<td><strong>Oxygen:</strong> Adequate oxygenation with $F_1O_2 &lt; 60%$, PEEP $\leq 10cmH_2O$ ($S_pO_2 &gt; 92%$)</td>
<td>No arrhythmias, CHF, unstable angina</td>
</tr>
<tr>
<td><strong>Ventilator Settings:</strong> Stable settings</td>
<td>No coma</td>
</tr>
<tr>
<td><strong>Patient Assessment:</strong> Comfortable, no increased WOB or dyspnea</td>
<td>Secure IV access (PICC)</td>
</tr>
<tr>
<td><strong>Weaning Technique:</strong> Trach collar or Bi-Pap</td>
<td>Secure alimentation route</td>
</tr>
<tr>
<td><strong>NPPV:</strong> Tolerates breaks off, stable settings</td>
<td></td>
</tr>
</tbody>
</table>
Admission Criteria Continued

- Complicated COPD patients
  - Patients who require Q 1-2 hour bronchodilator treatments.
  - Patients who require frequent pulmonary monitoring (continuous pulse oximetry, pulmonary toilet)
  - Patients who require intense teaching in order to become independent.
  - Patients who require high oxygen demands, and frequent medical/nursing interventions.
TEMPLE UNIVERSITY RESPIRATORY HIGH DEPENDENCY UNIT
Patient Care Organization

DAILY CARE

Medical
- Pulmonary/Critical Care Fellow & Attending
- Nurse Coordinator
- Psychologist
- Nutritionist

Nursing
- Pulmonary Care
- Med Delivery
- Nursing Care
- Teaching

Respiratory
- Bronchodilators
- Ventilator Teaching
- Interface Selection

Rehabilitation
- Extremity Training
- Ambulation
- Occupational Therapy
- Speech, Swallow Evaluation

DISCHARGE PLANNING

DME Vendor

Visiting Nurse Association

Community Local Hospital
- Ambulance Power Company

Social Services

OUTPATIENT
What are the essentials of the Care Plan?

- Multidisciplinary care plan involving the pulmonary/critical care physician, therapists, nurses, dieticians, pharmacists and others
- Does not recreate the ICU, clear admission and discharge criteria for less than critical care needs
- Easy access to transfer or readmit patients to the ICU
- Knowledgeable in weaning from invasive ventilation, initiating home ventilation and converting to noninvasive ventilation
- Ability to track patients longitudinally post discharge to home or extended care facility
How a HDRCU Integrates Medical and Surgical Care in Patients with Advanced Lung Disease

**Medical Care**
- Pre/Post Lung Transplantation
- Pre/Post LVRS
- COPD Exacerbations
- Ventilator-Dependent ICU Patients
- Noninvasive Mechanical Ventilation
- Sleep Disorders

**Surgical Care**
- Lung, Heart, Heart-Lung Transplant
- LVRS
- CABG in Severe Lung Disease
- Lung Cancer Resection in Patients with Severe Lung Disease
- Bariatric surgery

**HDRCU**
- Noninvasive Ventilation
- Wean Patients from Invasive Ventilation
- Instruct home pulmonary and ventilator care
- Multidisciplinary rehabilitation of ventilator-dependent patients
- Intense family/patient teaching
- Intense nursing and respiratory care interventions
Example of HDRCU Utilization in Medical and Surgical Care of a Representative Severe COPD Patient

**Medical Treatment**
- COPD
- Exacerbation
- Respiratory Failure
- MRICU (Invasive Ventilation)
- Wean
- Invasive
- NPPV

**Surgical Treatment**
- Home
- SICU
- LVRS
- Decline
- Lung Transplant

**HDRCU**
Advantages of a HDRCU Over Standard ICU Care

- Less expensive
- Unclogs ICU beds for ICU level patients
- Transitions patients to home more efficiently.
- Emphasizes maximizing functional status
- Extends medical/surgical programs to treat patients with advanced lung disease.
What are the Special Needs of Patients Admitted to our HDRCU?

- Need some form of mechanical ventilation, or special respiratory treatment device
- Patients requiring invasive ventilation require special attention to:
  - swallowing dysfunction
  - impaired communication skills
  - psychologic dysfunction
- Re-nutrition
- Respiratory and whole body reconditioning
- Close attention to new or changing medical conditions
Psychological Dysfunction in High Acuity COPD Patients

ICU Environmental Factors
- Sensory overload
- Sensory deprivation
- Sleep deprivation

Factors Associated with Poor/Inadequate Ventilation
- Hypoxemia
- Medication induced short-term memory loss
- Inability to communicate is most important factor contributing to fear, or inability to rest or sleep
- Lack of normal bodily function e.g., eating, social interaction, ambulation, etc.
Patient Involvement in Care

- Every patient upon admission and with every patient interaction is asked to identify 3 things that they feel comprises very good care.
- Patients then rate these items
- This identifies what is important to the patient and keeps the patient at the center of the care
- This has improved communication with patient and team
Orientation Techniques Used in Chronic HDRCU Patients
Evidenced Based Clinical Guidelines

- Tools that guide the team in the coordination and management of care.
- Guidelines are based upon current evidenced based clinical care and/or research.
- Incorporates patient safety, and performance improvement into daily guides.
- Guideline is reviewed 2x daily on rounds with team.
- Guidelines are updated annually or as needed.
# High Dependancy Respiratory Care Unit Practice Guideline

<table>
<thead>
<tr>
<th>Date:</th>
<th>HDRCU CLINICAL PRACTICE GUIDELINE</th>
<th>RN INITIALS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(7a-7p) 7p-7a N/A</td>
<td></td>
</tr>
</tbody>
</table>

## Assaert

- O2 to maintain SaO2 > 92%
- Continuous pulse oximetry (notify MD if less than 92%)
- Room air pulse Ox daily
- VS every 4 hours or as indicated by patient condition
- continuous monitoring via OX net system with trend printed
- Remove Foley unless clinically indicated
- Skin assessment every 8 hours/ reposition every 2 hours while in bed
- Weigh and record every Mon-Wed-Fri.
- Oral care every 4 hours
- Bipap/Vent/ O2 settings as ordered
- All alarms audible
- Peak flow/spirometry daily recording by resp. therap.
- Intake and Output every 8 hours
- If restrained, is physician order written?
- OOB to chair 2 X daily especially for meals
- Reinforce health education/ mediator teaching
- Reinforce Discharge planning needs with family/patient
- Reassure/ explore any anxieties of patient or family.
- Patient tolerating appropriate treatment (BIPap, Nebs)
- Explain/teach condition to Family/patient

## Goals:

- Hemodynamically stable, adequate respiratory parameters, & no skin breakdown.
- Sputum specimen with any sputum change
- Collect sputum specimen before commencing Antibiotics.
- Urine analysis/MSU

## Tests

- Labs, EKG, Respiratory status within expected limits.
- Nebulizer/MDI treatments as ordered
- IV meds changed to PO when clinically indicated
- Can nebs be changed to inhaler? If not ensure that RX for home nebs are written

## Goals:

- Maintain level of activity, and/or increase level of activity
- Can patient walk without desaturating <88% If NO then PT evaluation required
- Can patient ambulate steadily using normal assistive devices? If No PT eval is required
- Can patient feed, bathe, groom and dress themselves independently? If NO OT eval is required
- Family/ patient education is in progress regarding therapy

## Therapy

<table>
<thead>
<tr>
<th>RN Signatures</th>
<th>RN Signatures</th>
<th>RN Signatures</th>
<th>RN Signatures</th>
<th>RN Signatures</th>
</tr>
</thead>
</table>

*Initials denote completion of intervention. Circled initials indicates intervention not completed.*

*Form to be completed by RN during am and pm rounds.*
Under Nutrition in COPD

- Common problem:
  20% outpatients, 50% inpatients
- Respiratory muscle weakness
- Gas exchange abnormalities
- Decreased exercise tolerance
- Decreased survival
Principal Goals of Pulmonary Rehabilitation

Goals
- Reduce symptoms
- Decrease disability
- Increase participation in physical and social activities
- Improve the overall quality of life

Methods
- Exercise training
- Patient and family education
- Psychosocial and behavioral intervention
Lower Extremity Exercise
Speaking in Tracheotomy Patients

Electrolarynx

Passy-Muir Valve
Discharge Planning

- Weekly multidisciplinary discharge rounds are lead by Pulmonary Chief.
- Rounds include DME providers & community agencies
- Issues include power back up for home, equipment needs, education needs, financial needs
- Every HDRCU patients’ care is discussed and reviewed for timely discharge
- Case managers and attending review each case daily for progression of care and DC.
What are the Outcomes?

- Limited quality data collected under prospective, randomized and controlled conditions
- Health Care Financing Demonstration Chronic Ventilator Dependent Project, however, provides prospective and controlled (but not randomized) data on the effectiveness (cost and outcomes) of multidisciplinary rehabilitation provided in a non-ICU location in the chronic ventilator dependent patient
- The following charts represents TUH findings
Temple University Hospital

HDRCU Effect on LOS

Resp system diagnosis w/ vent support

Interstitial Lung Disease w/CC

COPD

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Pre-HDRCU LOS</th>
<th>Post-HDRCU LOS</th>
<th>LOS Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>COPD</td>
<td>13.8</td>
<td>12.2</td>
<td>1.6</td>
</tr>
<tr>
<td>Interstitial Lung Disease</td>
<td>8.4</td>
<td>6.5</td>
<td>1.9</td>
</tr>
</tbody>
</table>

Time Period

LOS in Days

Pre-HDRCU LOS: n=235
Post-HDRCU LOS: n=289

LOS Decrease

Pre-HDRCU LOS: n=235
Post-HDRCU LOS: n=289

Time Period

LOS in Days

Pre-HDRCU LOS: n=141
Post-HDRCU LOS: n=158

LOS Decrease

Pre-HDRCU LOS: n=49
Post-HDRCU LOS: n=38

Time Period

LOS in Days
Pulmonary Service Discharge Disposition

Disposition percentage

05-01-05 to 11-30-05 n=491
12-1-05 to 6-30-06 n=532

DC to home self care
DC to home with home care
DC to Skilled facility

0 10 20 30 40 50
percentage

Disposition
Complication Comparison

- Acute respiratory failure
- UTI
- Anemia
- Pulmonary insufficiency
- Pulmonary collapse
- Cardiac dysrhythmias

Pre-HDRCU Rate n = 425
Post-HDRCU Rate n = 485
30 Day Readmission Rate for COPD

![Graph showing 30 Day Readmission Rate for COPD with diagnoses including Asthma, Chronic Bronchitis, and Lung Disease 'other'. Green line represents Pre-HDRCU readmission rates, while red line represents Post-HDRCU readmission rates.](image)
Temple University Hospital
Patient Satisfaction Scores

Overall Patient Satisfaction Scores HDRCU

Percentage

Month

Sep-05  Oct-05  Nov-05  Dec-05  Jan-06  Feb-06  Mar-06  Apr-06  May-06
84.4   75.1   82    89.3   89.1   93.3   87.5   89.3   99.2
Temple University Hospital
Physician Satisfaction Scores

![Bar chart showing Physician Satisfaction Scores HDRCU from Sep-05 to Jun-06. The scores range from 88.1 to 100, with a steady increase over the months.]

- Sep-05: 88.1
- Oct-05: 78.1
- Nov-05: 90
- Dec-05: 99
- Jan-06: 100
- Feb-06: 100
- Mar-06: 100
- Apr-06: 100
- May-06: 100
- Jun-06: 100

Percentage

Month
HDRCU Effect on LOS in the Medical RICU

Medical RICU LOS

LOS in Days

12/04 to 5/05 n=500
12/05 to 5/06 n= 465

Time period

0 2 4 6 8 10 12 14
14 9

12/04 to 5/05
12/05 to 5/06

n=500
n= 465
Volume Increase in Complex COPD Patient Population

Average Monthly Volume of Admitted COPD Patients

- 39 patients admitted from 1/1/05 through 11-30-05
- 48 patients admitted from 12-01-05 through 5-10-06

Time Period

Volume
HDRCU Resource Utilization

Pulmonary Specific Resource utilization

- Antibiotic enteral
- Gram stain
- CXR
- Sputum Culture
- Blood Culture
- Antibiotic Parenteral

Percent utilization

Post HDRCU n= 928
Pre HDRCU n=966
Overall 30 day Readmission Rate

Overall 30 Day Readmission Rate

Pre- HDRCU n= 966

Post-HDRCU n=928

Time Period

Readmission Rate

19.6

13.1
Physical Therapy Utilization

COPD Patients Who Received PT Evaluation

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-HDRCU n= 966</td>
<td>13%</td>
</tr>
<tr>
<td>Post-HDRCU n=928</td>
<td>46%</td>
</tr>
</tbody>
</table>
Physical Therapy utilization

Percentage of COPD Patients Who Received Ongoing PT Interventions

- Pre-HDRCU n=966
- Post-HDRCU n=928

Time Period

Percentage

0% 10% 20% 30% 40% 50% 60%

4% 49%
Bi-Pap Complication Comparison

BIPAP Complication Rates

- Respiratory Failure
- CHF
- Pneumonia
- Acidosis
- Atrial Tachycardia
- Pneumonitis

Pre-HDRCU n=314
Post-HDRCU n=323
Bi-Pap Resource Utilization Comparison

Pre-HDRCU n=314
Post-HDRCU n=323
Chronic Fatigue
Overwhelming Hopelessness
Physical Immobility
Dyspnea

Prevent COPD Exacerbations
Avoid/Interrupt Viscous cycle of COPD

Decrease Mucus
Decrease Hyperinflation

Improve Sleep
Recondition
Renutrition

Treat Hypoxemia
Why Does It Work?

- Commitment from all levels of the organization. (CEO, Pulmonary Chief, staff RN, RT, PT, etc...)
- Open data sharing
- Ongoing change to the program
- Committed and expert nursing and ancillary leaders.
- Seamless relationship between the hospital and physician teams.
- Ongoing commitment to be experts in advanced pulmonary care
Chronic Pulmonary patients require multidisciplinary care due to their complex and diverse medical conditions.

Swallowing, ambulation and general conditioning may lag behind respiratory independence and requires early intervention to maximize recovery.

Optimum integration of multidisciplinary care results in a reasonably good long term QOL and enhances the medical and surgical programs for pulmonary disease.
Outcome Summary

- The HDRCU has resulted in the following
  - Decreased LOS
  - Decreased 30 day readmission rates
  - Increased patient satisfaction
  - Improved patient outcomes in mortality and complications.
  - Decreased ICU LOS
  - Improved resource utilization
  - Improved Nursing and ancillary recruitment and retention
Success is a Team Effort
QUESTIONS?