# **Respiratory Failure Tutorial**

On the <u>Hospital Daily Progress Note</u> suite of templates, there is a tutorial on Respiratory Failure. You can find that tutorial by clicking on this link. In SETMA's EMR this function is found by:

- Accessing the Daily Progress suite of templates
- Clicking on Plan/Comment button in the list of navigation tools.
- Clicking on the box under the heading categories.
- Selecting the option for Respiratory Failure.

When the Respiratory Failure option is made, the following pop-up appears.

Progress Respfail			×
Daily Progress Note Respiratory Failure	Type of Respiratory Failure     Acute, Type I <u>Which type of failure?</u> Acute, Type II       Progress     Chronic (pH >	pH < 7.3) <u>Causes</u> Susp (pH < 7.3) 7.3)	pected Cause
Vital Signs Blood Pressure 130 / 80 Pulse 80.00 Pulse 0x 0 Respirations FiO2 % Review of Systems Cough Review of Systems Cough Rhinorrhea Dyspnea Shortness of breath Fever PND Orthopnea Peripheral edema Pleuritic chest pain VVeakness Help History of stroke History of stroke Hi	Pulmonary Mechanics   Help     (measured on C-PAP)     Spontaneous Breathing Rate   26   /min     Negative Inspiratory Force   -18.0   cm H2C     Tidal Volume   mL   will     Vital Capacity   mL/kg     Rapid Shallow Breathing Index   0   Help     (if > 100, cannot extubate patient)   Physical Exam     Cardiovascular Exam   Neurological Exam     Respiratory Exam   Constitutional Exam     Current Ventilator Settings     Lab Results     pH   11     PaO2   mmHg   11     HCO3   mEq/L   11     HGB   g/dL   11	Laboratory T AMI q 6 hours ×3 Ammonia, Serum Arterial Blood Gas CBC CMP Cortisol, AM Cortisol, AM Cortisol, PM Cortisol, PM CPK Magnesium Phosphate Sputum Culture Sputum Culture Sputum Cram Stain TSH Treatment Help Antibiotics Coumadin Diprovan Pulmonary Physiotherapy (Chest percussion, postur drainage, vibration) New Ventilato Preparation fo	ests/Procedures Bronchoscopy Chest PA / Lateral Chest X-Ray, Portable Help CT Angiogram CT Chest Echocardiogram EKG Pulmonary Function Testing (once off ventilator) Pulmonary Mechanics Venous Doppler VQ Lung Scan Check for fecal impaction Enemas until clear Pulmonary Rehabilitation Strenthening Thoracentesis or Settings r Extubation

This template has a number of special features:

• At the top of the template is a function entitled **Which Type of Failure**? When that button is depressed the following appears:

Progress Respfaila	×
Type of	Respiratory Failure
	pH > 7.3
<b>Acute, Type I Failure</b> pH < 7.3 Low oxygen AND normal-to-low PaCC	Acute, Type 2 Failure pH < 7.3 2 Low oxygen and PaCO2 between 55 - 60
Acute vs. Chronic Acute hypercapnic respiratory failure develops respiratory failure develops over several da in bicarbonate concentration. Therefore, the acute and chronic hypoxemic respiratory fa The clinical markers of chronic hypoxemia, disorder.	ops over minutes to hours; therefore, pH is less than 7.3. Chronic ys or longer, allowing time for renal compensation and an increase pH usually is only slightly decreased. The distinction between ilure cannot readily be made on the basis of arterial blood gases. such as polycythemia or cor pulmonale, suggest a long-standing OK Cancel

This allows for a designation of the kind of respiratory failure.

• To the right of the **Which Type of Failure** button is a button entitled **Causes**. When that button is depressed a pop-up appears which is entitled, **Common Causes of Acute Respiratory Failure**.

Proa	ress	Resp	failc



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This function allows the provider to designate whether the patient has Type I or Type II respiratory failure and what the cause is believed to be.

• Immediately under the **Type of Failure** is a button which is entitled **Progress**.

Progress Respfailp			X		
Respiratory Failure Progress					
Current Values FiO2	.70	%	Goals		
Minute Ventilation		L/min	Goal is less than 10. Normal is 5.		
Peak Airway Pressure		cm H2O	Goal is less than 35. Normal is 5. Below 40 is mandatory.		
Mean Airway Pressure		cm H2O	Goal is less than 8-12		
OK Cancel					

This allows for the patient's progress toward extubation to be monitored and quantified.

• The next unique function is immediately below the first and third functions and is entitled **Pulmonary Mechanics Help.** 

## **Pulmonary Mechanics Help**

(These are the physiological measurements and are not used in clinical practice. When you order pulmonary mechanics in clinical practice, you will receive the following measurements: spontaneous breathing rate, negative inspiratory force, tidal volume and vital capacity.)

#### **Peak Airway Pressure**

Abnormal value is greater than 25 cm H2O.

Peak airway pressure is measured at the airway opening and is routinely displayed by mechanical ventilators. It represents the total pressure needed to overcome the inspiratory flow resistance (resistive pressure), the elastic recoil of the lung and chest wall (elastic pressure and the alveolar pressure present at the beginning of the breath (positive end-expiratory pressure [PEEP]). Any elevation in Peak Airway Pressure should prompt measurement of the end-inspiratory pressure (plateau pressure) by an end-inspiratory hold maneuver to determine the relative contributions of resistive and elastic pressures.

#### **Elastic Pressure**

Elastic pressure is the product of the elastic recoil of the lungs and chest wall (elastance) and the volume of gas delivered. For a given volume, elastic pressure is increased by increased lung stiffness (as in pulmonary fibrosis) or restricted excursion of the chest wall or diaphragm (eg. Tense ascities). Because elastance is the inverse of compliance, high elastance is the same as low compliance. An increase in elastic pressure (>10 CM H2O) suggests decreased lung compliance from edema, fibrosis, or lobar atelectasis; large pleural effusions or fibrothorax; or extrapulmonary restrictions as may arise from circumferential burns or other chest wall deformity, ascites, pregnancy, or massive obesity.



### **Resistive Pressure**

The resistive pressure is the product of circuit resistance and airflow. In the mechanically ventilated patient, resistance to airflow occurs in the ventilator circuit, the endottracheal tube, and most importantly, in the patient's airways. Note that even when these factors are constant, an increase in airflow increases resistive pressure. An abnormal value for resistive pressure is >10 cm H2O, which suggests plugging of endotracheal tube with secretions, intraluminal mass, increased intraluminal secretions, or bronchospasm.

#### Intrinsic PEEP

End-expiratory pressure in the alveoli is normally the same as atmospheric pressure. When the alveioli fail to empty completely because of airway obstruction, airflow limitation, or shortened expiratory time, the end-expiratory pressure may be positive relative to the atmosphere. This pressure is called intrinsic PEEP or autoPEEP to differnitiate it from externaly applied (therapeutic) PEEP, which is set by adjusting the mechanical ventilatory or by adding a mask to the airway that applies positive pressure throughtout the respiratory cycle. The demonstration of intrinsic PEEP should prompt a search for causes of airflow obstruction (eg. Airway secretions, bronchospasm), although a high minute ventilation (>20 liters/minute) alone can result in intrinsic PEEP in a patient with no airflow obstruction. If the cause is airflow limitation, intrinsic PEEP can be reduced by shortening inspiratory time (ie. Increasing insptratory flow) or reducing the respiratory rate, thereby allowing a greater fraction of the respiratory cycle to be spend in exhalation.

This pop-up describes the physiology of pulmonary mechanics and describes the elements of pulmonary mechanics which will indicate whether the patient is ready for extubation. The pulmonary mechanics necessary for determining if the patient is ready for extubation are:

- o spontaneous breathing rate,
- o negative inspiratory pressure,
- tidal volume and
- vital capacity.
- The fifth unique feature of the Daily Progress Note Respiratory Failure template is entitled **Rapid Shallow Breathing Index** (RSBI).

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If the RSBI is above 100 the patient cannot be extubated. The RSBI is calculated automatically by the EMR.

• At the bottom of the third column is a function entitled New Ventilator Settings

rogress Planvent		
	New Ventilato	r Settings
Mode Image: Constraint of the constr	Amin mL L/min % cm H2O cm H2O cm H2O	Post Intubation Orders     Titrate FIO2 to keep saturation >=     CXR portable STAT     ABGs in 20 minutes     Continuous pulse oximetry     Sedation     Morphine sulfate 2-10 mg IV q 1 hour PRN agitation     If morphine allergy or MAP<60 mm Hg, fentanyl 25-500
*If patient ventilated in SIMV mode, respiratory to add pressure support to result in spontane volume of at least 6 cc/kg ideal body weight. mode chosen and patient has no spontaneous H2O pressure support.	therapist ous tidal f SIMV : add 10cm OK	Cancel

This allows a provider to create new ventilator settings which will print out on the order set and which then can be placed on the inpatient chart.

• The seventh and last unique feature of the **Daily Progress Note Respiratory Failure** template is launched by clicking the last button in the third column which is entitled **Preparation for Extubation**.

Progress Respfaile		×
Preparation fo	or Extubation	
Please provide responses to the highlighted question(s) be	elow	
Criteria	Value	Criteria Met
1. Underlying condition has been addressed?	C Stable C Resolved C Unresolved	
2. PaO2/FiO2 ratio > 150	0	
3. pH > 7.25		
4. FiO2 < 40		
5. PEEP < 5 cm H2O		
6. Minute ventilation < 10 L/min	19.2	No
7. Patient is capable to initiate respiratory effort?	C Yes C No	
8. PaO2 > 60		
9. Heart rate < 140	80.00	Yes
10. Afebrile (temperature < 100.4 F)		
11. Hemoglobin > 8.9		
12. Stable electrolytes?	C Yes C No	
ОК	Cancel	

This template gives the criteria which need to be met before extubation can be undertaken.