

HEART FAILURE

Estimated Time: 45 minutes • Debriefing Time: 40 minutes



Scan to Begin



Patient Name: Hector Fernandez

SCENARIO OVERVIEW

Students are called to the ICU to set a mechanical ventilator for a patient who is being transferred from Emergency Department following an emergent intubation (due to exacerbation of end-stage CHF). The students set up a ventilator using the information provided and then receive handoff report from another RT. Students perform a patient assessment, ventilator check, and radial ABG's. (This scenario includes videos of both right and left Modified Allen's test for students to assess prior to ABG puncture.) After ABG's have resulted, vent changes are required.

LEARNING OBJECTIVES

1. Perform a focused respiratory assessment
2. Recognize and respond to abnormal findings
3. Evaluate objective and subjective data
4. Implement and follow evidence-based standards and protocols
5. Safely manage mechanical ventilation
6. Demonstrate appropriate communication
7. Document accurately

CURRICULUM MAPPING

WTCS RESPIRATORY THERAPY PROGRAM OUTCOMES

- Apply respiratory therapy concepts to patient care situations
- Demonstrate technical proficiency required to fulfill the role of a respiratory therapist
- Practice respiratory therapy according to established professional and ethical standards

RESPIRATORY DISEASE

- Evaluate radiologic images of the chest
- Analyze signs, symptoms, etiology, pathogenesis and treatment for cardiovascular diseases/disorders

RESPIRATORY AND CARDIAC PHYSIOLOGY

- Apply the principles of gas transport
- Apply the principles of ventilatory mechanics
- Interpret blood gas data
- Evaluate fluid and electrolyte balance

RESPIRATORY THERAPEUTICS II

- Perform arterial puncture

RESPIRATORY AIRWAY MANAGEMENT

- Apply advanced artificial airways
- Demonstrate skill of secretion removal

RESPIRATORY LIFE SUPPORT

- Explain the general principles of mechanical ventilation
- Apply invasive mechanical ventilation
- Operate various ventilators
- Evaluate patient response to mechanical ventilation

RESPIRATORY CLINICAL PRACTICE

- Apply standard precautions
- Assess vital signs
- Perform pulse oximetry
- Perform a pulmonary exam
- Perform open system suction
- Perform closed system suction
- Perform cuff pressures
- Set up various types of ventilators
- Check a ventilator
- Perform arterial puncture

SIMULATION LEARNING ENVIRONMENT & SET-UP

PATIENT PROFILE

Name: Hector Fernandez

DOB: 09/06/19XX

Age: 62

MR#: 41219

Gender: Male

Height: 165 cm (5'5")

Weight: 86.4 kg (195#)

Allergies: penicillin (hives)

Admitting Diagnosis: Respiratory Failure,
exacerbation of CHF

Medical History: congestive heart failure,
coronary artery disease, anterior MI with
stenting – 4 years ago, chronic atrial
fibrillation, hypertension, chronic renal
insufficiency, COPD, OSA, restless leg
syndrome, hypothyroidism, diabetes
mellitus 2, chronic constipation

Surgical History: R TKR – 15 years ago

Code Status: Full

Ethnicity: Hispanic

Spiritual Practice: Catholic

Primary Language: Spanish

Secondary Language: English

EQUIPMENT/SUPPLIES/SETTINGS

Environment

- Inside room: Patient in bed, as close to fowlers position as possible
- Inside or outside room: Hand sanitizer and/or sink
- Outside room: Computer or form(s) for documentation

Patient

- Hospital gown
- No moulage
- ID band present with QR code
- Intubated with 8.0 ETT secured 24 at the teeth with a commercial tube holder
- IV in place with medications running per included MAR

Monitor Settings

- Simulator vitals: HR 104, RR 16, BP 118/78, Temp 37.8, SpO₂ = 100% when the patient “arrives” because being “bagged with 100% O₂. Sats will need to be adjusted per facilitator request throughout the scenario based on student decisions.
- Patient is sedated. It may be easier to paralyze the patient and allow the mechanical ventilator to initiate all of the breaths.

Supplies

- General
 - Respiratory Equipment
 - Mechanical ventilator and supplies
 - Equipment to obtain an ABG
 - Resuscitation Bag and Mask
 - Oral and endotracheal suction supplies (open or closed system)

Medications

- None needed for this scenario.
- However, for realism, the technician should review the MAR and have the appropriate IV's running.

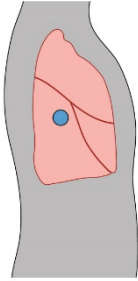
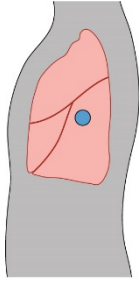


QR CODES

<p>START</p> 	<p>PATIENT</p> 	<p>REPORT</p> 	<p>PATIENT ID</p> 
<p>PATIENT IV</p> 	<p>RIGHT LEG</p> 	<p>LEFT LEG</p> 	<p>LEFT ALLEN'S</p> 
<p>RIGHT ALLEN'S</p> 	<p>FACILITATOR</p> 		

CHEST QR CODES

Cut along the dotted lines. Fold along the solid line to create a bi-fold of the diagram and QR code.

			
ANTERIOR 2	ANTERIOR 3	ANTERIOR 6	ANTERIOR 7
			
			
POSTERIOR 0	POSTERIOR 1	POSTERIOR 4	POSTERIOR 5
			

	
RIGHT AXILLARY 1	LEFT AXILLARY 1
	

TEACHING PLAN

PREBRIEF

The facilitator should lead this portion of the simulation. The following steps will guide you through Prebrief.

- Scan the **QR Code: “Scan to Begin”** while students are in Prebrief.
- “Meet Your Patient” (on iPad) and explain how the iPad works in the simulated learning environment including:
 - Explain how to use the iPad scanner and QR codes. Remind students that there are multiple QR codes in the simulation, but they should only scan them if they think it will provide data necessary for their assessment and evaluation of the patient.
 - For some scenarios, it may be helpful to tell students where the QR code are located. For others, you may want students to “find” the QR codes during their assessments. This is your choice.
 - Describe how a QR code sound will work in the scenario. For the most authentic sound experience, student should use ear buds or the ARISE “stethoscope” for all QR codes with the following symbol: □. Example: **QR Code: Chest Anterior 1** □
 - As the facilitator, you should be aware that throughout the simulation some QR codes are necessary to the programming of the iPad content. Directions for which QR codes are required (to be scanned) in each state are listed under each state of the documentation below. The QR codes are also in **BOLD** type.
 - Level tab – This tab “tells” the content in the iPad to change to what is needed for the next state of a simulation. It is used a few times in this scenario after the provider is notified to display new orders (those just given over the phone) and lab results, etc.
 - Medication QR Codes – The student(s) must scan **QR Code: Patient ID** prior to scanning any medication. That scan is valid for 2 minutes and then it “times out.” The student(s) will need to scan **QR Code: Patient ID** again to give more medications.
 - MAR Hyperlinks – On the MAR all medications are underlined and hyperlinked to DailyMed, which is a medication reference housed by the

National Library of Medicine. Students can click on these links during the simulation for up-to-date medication content, labels, and package insert information.

- Discuss the simulation “Learning Objective(s)” (on iPad) as well as any other Prebrief materials
- Get “Phone Call” on iPad
 - Possible Facilitator Questions
 - What are your priorities for this patient?
- After the “phone call” the iPad displays a plaque that reads, “Patient is on his way from the ER. Please set up ventilator before he arrives.”
 - There is no chart available in the iPad at this time. Students should proceed to the ICU room and set up a ventilator using the information they received in the phone call.
- Available Tabbed iPad Content

LEVEL 1

The iPad reads, “The iPad is at Level 1.”

SCANNER

Use this to scan available QR Codes.

EXIT

The iPad reads, “Are you sure you want to exit? All data will be lost.”

- If “No” is selected, the iPad will return to the tabbed content.
- If “Yes” is selected, the iPad will let the student(s) exit and prompt them to complete an embedded 3-5 minute survey.

STATE 1

VENTILATOR SET UP & APPLICATION

- Patient Overview
 - The patient has not arrived yet. Give students 10 minutes or so to set up the ventilator using the information they received on the phone call.
- Expected Student Behaviors
 - Perform appropriate hand hygiene and infection control
 - Set up a mechanical ventilator according to NBRC guidelines in a timely manner.
 - Students should also ready the ICU room for other patient needs including but not limited to suction supplies and equipment.
 - Safely apply mechanical ventilation and assure functionality.
 - Facilitator Note: After the mechanical ventilator is set and the room is ready, have the patient “arrive” in the ICU and have students connect the patient to the ventilator and make initial adjustments to alarms, etc.
- Technician Prompts
 - Nothing is needed for the patient.
 - Optional: The technician or faculty member could play the role of a nurse and ready the ICU room for the patient by getting the bed, monitor, IV's etc. ready.
 - Optional: The technician, faculty member, or another student could role play the respiratory therapist who is handing off the patient to the students in the ICU.
- Facilitator Questions
 - What settings did you choose for this patient and why?
 - Given the information you received over the phone, what information are you anticipating in report?
- Tabbed iPad Prompts and Content
 - When the students have completed the “Expected Student Behaviors” as above, scan **QR Code: Facilitator**.

- The iPad will read “You have been approved to proceed.”
- The iPad automatically advances to Level 2. (Students are not prompted to this.)
- The iPad will play the “Patient Video” at this time.
 - Possible Facilitator Questions
 - Given this video, can you make any conclusions about Hector’s condition?
- The iPad will play a video of handoff “Report.”
 - Possible Facilitator Questions
 - Given this report, what are your priorities for Hector?
- Advance to the “Patient Profile” screen (on iPad). This will act as a simulated patient chart.
- Students can view the tabbed content on the iPad (see below) throughout the simulation as needed.
 - Facilitator Note: You may want to give students some time to review the patients chart.

H&P

History and Physical

CHIEF COMPLAINT: Shortness of breath, impending respiratory failure

HISTORY OF PRESENT ILLNESS: Hector presents today to the Emergency Department with shortness of breath that has worsen over the course of several days. His wife is with him and she is providing most of the details of his illness. Discussed Code Status with his wife. He was a Full Code at his last admission 2 months ago. His wife states that Hector recently filled out new Advance Directive papers and that she would go home and get them after my examine.

PAST MEDICAL/SURGICAL HISTORY: Congestive heart failure, coronary artery disease, anterior MI with stenting – 4 years ago, chronic atrial fibrillation, hypertension, chronic renal insufficiency, COPD, OSA, restless leg syndrome, hypothyroidism, diabetes mellitus 2, chronic constipation, R TKR – 15 years ago

ER/HOSPITALIZATIONS IN THE LAST 12 MONTHS: Was admitted to the ICU 2 months ago for about 2 weeks following a similar presentation.

MEDICATIONS: See medication reconciliation record.

ALLERGIES: Penicillin (hives)

FAMILY MEDICAL HISTORY: Father dies from an apparent MI at age 50. Mother died from complications of congestive heart failure at age 58. He has no siblings.

REVIEW OF SYSTEMS: Abbreviated due to the acuity of current medical condition – he is on BiPAP. His wife is providing most of the details.

HEENT: The wife states, he has been sleeping “all of the time” and it is difficult to arouse him. She is unaware of any recent injury, headaches or change in vision.

Respiratory: He is obviously and significantly dyspneic. This has increased over the past few days.

Cardiovascular: Wife states his chest always hurts when he breathes fast. He hasn't complained about that recently because he's been sleeping all of the time.

Peripheral Vascular: Wife states that his legs are “a little puffier.”

Gastrointestinal: Wife is not sure of any changes in appetite or weight gain/loss.

Endocrine: History of diabetes mellitus Type 2. Wife states that he hasn't been urinating much at all.

PHYSICAL EXAM:

Vital signs: BP= 128/72, T= 38.9, P= 114, R= 32, O₂= 93% on BiPAP per respiratory therapy, Height= 165 cm, Weight= 86.4 kg

General Appearance: 62-year-old male who appears acutely ill. He is currently on the BiPAP per respiratory therapy.

HEENT: unremarkable

Respiratory/Chest: Breath sounds are diminished throughout with fine, wet crackles in all lung fields. No cyanosis or clubbing noted.

Cardiovascular: Tachycardic in the 110's. Irregular S1S2 rhythm without murmur. S3 & S4 present.

Vascular/extremities: Pedal pulses – L 2/4 / R 2/4 Capillary refill time less than three seconds. 3 plus pitting edema bilaterally. Right leg is reddened and consistent with cellulitis.

Gastrointestinal/abdomen: unremarkable

Genitourinary: No CVA tenderness.

ASSESSMENT: Impending Respiratory Failure, Exacerbation of CFH, & Probable RLL cellulitis

PLAN: STAT CBC with differential, Chem 7, Magnesium, BNP, Liver Enzymes, CK & Troponin, & INR. STAT portable chest x-ray, ECG, & bedside echocardiogram. Respiratory Therapy Consult and BiPAP management – obtain STAT ABG. 80 mg furosemide IV, STAT.

Electronically Signed - Dr. Hospita, MD

ORDERS

Provider Orders

Date	Time	Order
Today	2 hours ago	Emergency Department Orders
		Continuous telemetry and SpO2 monitoring
		Obtain current weight
		Insert Foley catheter for strict I & O
		Obtain accurate home medication history
		STAT Labs: CBC with differential, Chem 7, Magnesium, BNP,
		Liver Enzymes, CK & Troponin, INR
		STAT portable chest x-ray: respiratory failure
		STAT ECG
		STAT bedside echocardiogram
		STAT Respiratory Therapy Consult
		STAT BiPAP per protocol, O2 to keep SaO2 > 90%
		STAT ABG
		80 mg furosemide IV, STAT

		K+ replacement protocol-----Dr. Hospita, MD
Today	90 minutes	STAT intubation for hypercapneic respiratory failure
	ago	STAT Succinylcholine IV Push 1.5 mg/kg – once for intubation
		STAT Etomidate IV Push 0.3 mg/kg – once for intubation
		Start furosemide IV infusion at 10 mg/hour
		Post intubation: Propofol IV infusion @ 50-100 mcg/kg/minute
		– titrate to achieve appropriate level of sedation (see adult ICU sedation protocol)
		STAT portable chest x-ray post intubation for tube placement
		Mechanical Ventilation per RT
		ABG's 30 minutes post placement on ventilator
		Place OG tube
		Consult Pulmonology-----Dr. Hospita, MD
Today	15 minutes	Transfer to ICU -----Dr. Hospita, MD
	ago	Continue: Propofol IV infusion @ 50-100 mcg/kg/minute
		– titrate to achieve appropriate level of sedation (see adult ICU sedation protocol)
		Dr. Tiffany Sam, Pulmonology, to assume care --Dr. Hospita, MD
Today	20 minutes	Norepinephrine IV infusion – start @ 0.1-0.15 mcg/kg/min then
	ago	titrate to 0.025 to 0.05 mcg/kg/min to achieve MAP <85 and
		>65-----Dr. Hospita, MD

MAR

Medication Administration Record

Scheduled	
Continuous Infusion	
Propofol IV infusion @ 50-100 mcg/kg/minute – titrate to achieve appropriate level of sedation (see adult ICU sedation protocol)	Started
	45 minutes ago
Norepinephrine IV infusion – start @ 0.1-0.15 mcg/kg/min then titrate to 0.025 to 0.05 mcg/kg/min to achieve MAP <85 and >65	Started
	15 minutes ago

PRN

Discontinued		
Furosemide 80 mg IV, STAT	Discontinued	Last Given
	2 hours ago	2 hours ago
STAT Succinylcholine IV Push 1.5 mg/kg – once for intubation	Discontinued	Last Given
	1 hour ago	1 hour ago
STAT Etomidate IV Push 0.3 mg/kg – once for intubation	Discontinued	Last Given
	1 hour ago	1 hour ago
Furosemide IV infusion, now @ 10 mg/hour	Discontinued	Last Given
	45 minutes ago	45 minutes ago

DAILY RECORD**Daily Record**

Vitals	Today – 2 hours ago	Today – 90 minutes ago	Today – 1 hour ago		
Pulse	114	106	106		
Resp. Rate	32	24	16		
BP Systolic	128	102	118		
BP Diastolic	72	68	78		
Temp (°C)	38.9	38.2	37.8		
O2 Saturation (%)	93	95	94		
Applied Oxygen	BiPAP	BVM	Vent		
Pain	2	Not assessed	0		

24 HR I & O (ml)					
Input					
Output					
Total					

Daily Weight (kg)	Today – 90 minutes ago				
	86.4				

VITALS

The iPad shows the “enterable” vitals screen.

VENTILATOR FLOWSHEET

The iPad shows the “enterable” ventilator flowsheet. The first column is populated with the assessment data entered in the emergency department. See below.

Respiratory Therapy – Ventilator Care Flowsheet

* Blank field = not assessed *

Patient Assessment	Today – 40 minutes ago	[time]	[time]	[time]
Heart Rate	106			
Respiratory Rate	16			
BP Systolic	116			
BP Diastolic	82			
Temp (°C)	38.2			
O2 Saturation (%)	100			
Level of Consciousness	Sedated			
Color	Normal for skin tone			
Lung Sounds – RUL	Fine crackles			
Lung Sounds – RML	Fine crackles			
Lung Sounds – RLL	Fine crackles			
Lung Sounds – LUL	Fine crackles			
Lung Sounds – LLL	Fine crackles			

Airway Assessment	Today – 40 minutes ago	[time]	[time]	[time]
Airway/Mask Type	Endotracheal Tube			

Airway/Mask Size	8.0			
ETT Location (at the teeth)	24			
ETT Location	Center			
ETT Relocated (✓)				
Secure & Patent (✓)	(✓)			
Cuff Pressure (cmH ₂ O)	Minimal Occluding Volume 23			
Oral Care Completed (✓)				
Oral Secretions	Moderate, Thin, Clear			
Tracheal Secretions	Small, Thin, Clear			

Ventilator Bundle	Today – 40 minutes ago	[time]	[time]	[time]
HOB > 30°	✓			
Daily Sedation Vacation	Contraindicated			
Assess Weaning Readiness	Contraindicated			
PUD Prophylaxis	✓			
DVT Prophylaxis	✓			

Ventilator Assessment	Today – 40 minutes ago	[time]	[time]	[time]
Vent/BiPAP	Vent			
Mode	Volume Control			
Set Rate	16			
Total Rate	16			
Set V _T (ml)	400			
Expiratory V _T (ml)	452			
Spontaneous V _T (ml)				
Exhaled Ve (lpm)	7.2			

Set PS or PC (cmH2O)				
O2 (%)	100			
Set IPAP				
Set PEEP (cmH2O)	5			
Total PEEP (cmH2O)	5.8			
PIP (cmH2O)	32			
Plateau (cmH2O)	24			
MAP (cmH2O)	14.2			
C _L -Static (ml/cmH2O)	13			
C _L -Dynamic (ml/cmH2O)	8.3			
Raw (cm H2O/L/sec)	8.7			
Peak Flow (lpm)	55			
Waveform	Square			
Inspiratory Time	0.52			
I:E Ratio (of set rate)				
Sensitivity	3 lpm			
All Alarms On & Set (✓)	✓			
Bag/Mask @ bedside (✓)	✓			

PROGRESS NOTES

Progress Notes

Date/Time	Note
Today/45 minutes ago	Pt. arrived in the ED via EMS and was immediately placed on BiPAP per protocol (18/6 and 100 %) via a small full face mask secondary to RR in the 30's and Sats in the low 90's on 100% O2 via NRB. BBS revealed fine crackles and diminished throughout all lung fields. Pt. was difficult to arouse, but would wake and answer simple yes or no questions. ABG was obtained about 20 minutes after BiPAP was initiated. Results revealed hypercapneic respiratory failure and a decision was made to intubate and place on mechanical ventilation per protocol. Pt. was intubated via anesthesia without incident with an 8.0 ETT secured with a commercial tube holder in the center at 24 at the teeth. Patient was placed on VC 16, 400, 100, and +5. Tolerating well with sedation. See ventilator Flowsheet for further details. ABG's to be drawn per protocol. Will continue to monitor. -----Michael Abbot, RRT-ACCS

LABS-DIAGNOSTICS

Laboratory Results

CBC with Differential			
	Today – 90 minutes ago	Units	Reference Range
WBC	11.8	x10 ³ uL	F: 4.7-10.3/M: 4.5-10.5
RBC	3.6	x10 ⁶ uL	F: 4.0-4.9/M: 4.0-4.9
Hgb	9.9	g/dL	F:10.9-13.3/M:11.0-13.3
HCT	30.2	%	F: 33.0-39.6/M: 32.7-39.3
MCV	76.7	fL	F: 78.5-90.4/M: 76.5-90.6
MCH	25	pg	25-33
MCHC	30	g/dL	31-37
RDW	12.3	%	F: 11.6-13.4/M: 12.0-14.0
Platelet	182	x10 ⁹ uL	F: 183-368/M: 194-364
MPV	7.5	7.4-0.4	7.4-10.4
Neutro	72	38-68	38-68
Lymph	25.7	25-54	25-54
Mono	0.3	0-0.8	0-0.8
Eos	1	1-5	1-5
Baso	1	0-2	0-2

Chem 7 with Magnesium			
	Today – 90 minutes ago	Units	Reference Range
Glucose	162	mg/dL	Fasting 70-150
BUN	32	mg/dL	10-25
Creatinine	3.2	mg/dL	F: 0.4-1.4/M: 0.5-1.5
Sodium	134	mEq/L	135-145
Potassium	3.8	mEq/L	3.5-5.3
Chloride	108	mEq/L	98-108

Carbon Dioxide	28	mEq/L	23-27
Magnesium	1.7	mEq/L	1.5-2.5

Liver Enzymes

	Today – 90 minutes ago	Units	Reference Range
ALT	53	U/L	7-55
AST	36	U/L	8-48
ALP	102	U/L	45-115
Albumin	4.8	g/dL	3.5-5.0
Total Protein	6.9	g/dL	6.3-7.9
Bilirubin	0.9	mg/dL	0.1-1.2

BNP

	Today – 90 minutes ago	Units	Reference Range
BNP	2450	pg/mL	< 75 years old = <125 > 75 years old = <450

CK & Troponin

	Today – 90 minutes ago	Units	Reference Range
CK	330	U/L	M: 52-336/F: 38-176
Troponin	0	ng/mL	<0.1

INR

	Today – 90 minutes ago	Units	Reference Range
INR	2.4	seconds	< 1.1

Arterial Blood Gas (ABG)

	Today – 1 hour ago	Units	Reference Range
pH	7.21		7.35-7.45
PaCO ₂	68	mmHg	35-45
PaO ₂	89	mmHg	80-100
HCO ₃	26	mmol/L	22-26
Base Excess	-2	mmol/L	0+/-3
SaO ₂	94	%	
Site = ® Radial	Modified Allen's test = √		% O ₂ = 100

IMAGING**Imaging Report**

DESCRIPTION: Portable x-ray post-intubation for respiratory failure.

EXAM: Portable AP chest

REASON FOR EXAM: Intubation

COMPARISON EXAM: Not available.

TECHNIQUE: 1.5 mAS @ 125 kvp

Dictation Pending.

PROTOCOLS

The iPad displays the “Adult Mechanical Ventilator Policy & Procedure.” See Appendix A for a printable version.

STATE 2

PATIENT ASSESSMENT & ABG'S

- Patient Overview
 - The patient is on the ventilator per protocol. Students should perform a patient assessment, ventilator check, draw ABG's.
- Expected Student Behaviors
 - Perform appropriate hand hygiene and infection control
 - Introduce themselves and verify the patient (can scan **QR Code: Patient ID**)
 - Accurately obtain vital signs and interpret for an adult patient
 - Students can enter vitals on the iPad, but they are not tied to any iPad programming.
 - Perform a focused respiratory assessment
 - Inspection – Students will not find any abnormalities in the chest exam. When the extremities are evaluated, bilateral pitting edema and Right-lower extremity cellulitis is found (Scan **QR Code: Right Leg & QR Code: Left Leg**). Students should assess the patient's airway and ETT at this time as well as assess/measure cuff pressure.
 - Palpation – Students will not find any abnormalities in the chest exam.
 - Percussion – Students will not find any abnormalities in the chest exam.
 - Auscultation – Scan **QR Code: Chest** □
 - There are ten QR codes to apply to the chest – see above Chest QR Code chart for locations
 - Students will hear the following breath sounds:
 - Crackles are noted in all lung locations.
 - Perform a ventilator check
 - Students should perform all necessary calculations at this time including: compliance, resistance, etc.

- Optional: Perform closed or open suction procedure
 - If the students feel there is a need to suction or would like to evaluate the patency of the ETT, suctioning could be performed at this time.
 - Facilitator Note: If students choose to suction, you may need to pause and discuss how this will affect ABG results.
- Safely perform a radial ABG
 - Facilitator Note: There is a video of a right Modified Allen's test (**QR Code: Right Allen's**) and a left Modified Allen's test (**QR Code: Left Allen's**).
 - Students can scan either or both QR Codes to evaluate for collateral circulation prior to the ABG puncture.
- Recognize and respond to abnormal findings
- Document accurately
 - The ventilator check can be documented on the provided enterable ventilator flowsheet located on the iPad in the Ventilator Flowsheet tab.
- Technician Prompts
 - Nothing is required from the patient.
- Facilitator Questions
 - Analyze the vital signs: are they within normal limits?
 - Analyze the findings from the pulmonary exam: do you have any concerns?
 - Why is it necessary to perform a Modified Allen's test?
 - How do you know that mechanical ventilator is functioning correctly for this exact patient?
 - What side effects can you expect from the mechanical ventilator?
- Tabbed iPad Prompts and Content
 - When the students have completed the "Expected Student Behaviors" as above, scan **QR Code: Facilitator**.
 - The iPad will read "You have been approved to proceed."

- The iPad automatically advances to Level 3. (Students are not prompted to this.)

LEVEL 2/3

- When the Level 2 tab is tapped, the iPad reads, “The iPad is at Level 2.”
- The Level 2 tab will automatically change to a Level 3 tab after **QR Code: Facilitator** is scanned.
- When the Level 3 tab is tapped, the iPad reads, “The iPad is at Level 3.”

STATE 3

ABG INTERPRETATION & VENTILATOR ADJUSTMENT

- Patient Overview
 - After **QR Code: Facilitator** is scanned, the iPad alerts students to resulted labs with 1) a dinging sound and 2) a plaque that reads, “Labs have resulted.” Students should interpret the ABG’s and make adjustments to the ventilator per the provided Protocol.
- Expected Student Behaviors
 - Interpret ABG results
 - Adjust mechanical ventilator settings per the provided Protocol.
 - Demonstrate appropriate communication with the interprofessional team
 - Students should inform the RN of the changes.
 - Document accurately
 - Ensure students document changes on the ventilation flowsheet.
- Technician Prompts
 - Nothing is required from the patient.
 - The technician or faculty member could play the role of the RN in person or via telephone.
 - Ensure students inform the RN of the changes made to the ventilator.
 - Playing the RN role, ask the students to explain why those changes were made.
- Facilitator Questions
 - Interpret the lab results: What is of primary concern for this patient and why?
 - Do the lab results lead you towards a certain diagnosis? If so, what would that be and why?
 - How does a protocol aid your treatment of the patient?

- Tabbed iPad Prompts & Content
 - When the students have completed the “Expected Student Behaviors” as above, scan **QR Code: Facilitator**.
 - The iPad will read “You have been approved to proceed.” “Scenario objectives have been completed. You may exit at any time.”
 - The Level 3 tab will automatically disappear (Students are not prompted to this.)

LABS-DIAGNOSTICS

Laboratory Results

CBC with Differential			
	Today – 2.5 hours ago	Units	Reference Range
WBC	11.8	x10 ³ uL	F: 4.7-10.3/M: 4.5-10.5
RBC	3.6	x10 ⁶ uL	F: 4.0-4.9/M: 4.0-4.9
Hgb	9.9	g/dL	F:10.9-13.3/M:11.0-13.3
HCT	30.2	%	F: 33.0-39.6/M: 32.7-39.3
MCV	76.7	fL	F: 78.5-90.4/M: 76.5-90.6
MCH	25	pg	25-33
MCHC	30	g/dL	31-37
RDW	12.3	%	F: 11.6-13.4/M: 12.0-14.0
Platelet	182	x10 ⁹ uL	F: 183-368/M: 194-364
MPV	7.5	7.4-0.4	7.4-10.4
Neutro	72	38-68	38-68
Lymph	25.7	25-54	25-54
Mono	0.3	0-0.8	0-0.8
Eos	1	1-5	1-5
Baso	1	0-2	0-2

Chem 7 with Magnesium

	Today – 2.5 hours ago	Units	Reference Range
--	-----------------------	-------	-----------------

Glucose	162	mg/dL	Fasting 70-150
BUN	32	mg/dL	10-25
Creatinine	3.2	mg/dL	F: 0.4-1.4/M: 0.5-1.5
Sodium	134	mEq/L	135-145
Potassium	3.8	mEq/L	3.5-5.3
Chloride	108	mEq/L	98-108
Carbon Dioxide	28	mEq/L	23-27
Magnesium	1.7	mEq/L	1.5-2.5

Liver Enzymes

	Today – 2.5 hours ago	Units	Reference Range
ALT	53	U/L	7-55
AST	36	U/L	8-48
ALP	102	U/L	45-115
Albumin	4.8	g/dL	3.5-5.0
Total Protein	6.9	g/dL	6.3-7.9
Bilirubin	0.9	mg/dL	0.1-1.2

BNP

	Today – 2.5 hours ago	Units	Reference Range
BNP	2450	pg/mL	< 75 years old = <125 > 75 years old = <450

CK & Troponin

	Today – 2.5 hours ago	Units	Reference Range
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CK	330	U/L	M: 52-336/F: 38-176
Troponin	0	ng/mL	<0.1

INR			
	Today – 2.5 hours ago	Units	Reference Range
INR	2.4	seconds	< 1.1

Arterial Blood Gas (ABG)			
	Today – 2 hours ago	Units	Reference Range
pH	7.21		7.35-7.45
PaCO ₂	68	mmHg	35-45
PaO ₂	89	mmHg	80-100
HCO ₃	26	mmol/L	22-26
Base Excess	-2	mmol/L	0+/-3
SaO ₂	94	%	
Site = ® Radial	Modified Allen's test = √		% O ₂ = 100

Arterial Blood Gas (ABG)			
	Today – now	Units	Reference Range
pH	7.32		7.35-7.45
PaCO ₂	54	mmHg	35-45
PaO ₂	98	mmHg	80-100
HCO ₃	26	mmol/L	22-26
Base Excess	-2	mmol/L	0+/-3
SaO ₂	98	%	
Site = ® Radial	Modified Allen's test = √		% O ₂ = xxx

LEVEL 3/EXIT

- When the Level 3 tab is tapped, the iPad reads, “The iPad is at Level 3.”
- The Level 3 tab will automatically disappear **QR Code: Facilitator** is scanned.
- When the Exit tab is tapped, the iPad reads, “Scenario objectives have been met. Are you sure you want to exit the game?”
 - If “No” is selected, the iPad will return to the tabbed content.
 - If “Yes” is selected, the iPad will let the student(s) exit and prompt them to complete an embedded 3-5 minute survey.

DEBRIEF

Nothing needed from the iPad.

QUESTIONS

1. How did you feel this scenario went?
2. What were the main issues you had to deal with when caring for Hector?
3. Review understanding of learning objective: Perform a focused respiratory assessment.
 - a. What concerns did you find during your physical assessment and evaluation?
 - b. Is this what you would expect in a patient with hypercapneic respiratory failure and end-stage congestive heart failure? Why or why not?
 - c. If you could “do over” any part of Hector’s assessment, what would it be and why?
4. Review understanding of learning objective: Recognize and respond to abnormal findings.
 - a. What abnormal findings did you encounter in this scenario?
 - b. How did you respond to those abnormal findings?
 - c. Were the findings what you expected? Why or why not?
 - d. Specifically comment about your evaluation of the chest xray. What were your findings?
5. Review understanding of learning objective: Evaluate objective and subjective data.
 - a. What abnormal findings did you find in the vital signs and/or physical assessment? How did you respond to these findings?
 - b. Explain how the mechanical ventilator will affect the ABG results.
6. Review understanding of learning objective: Implement and follow evidence-based standards and protocols
 - a. How did the protocol in today’s scenario help you in caring for Hector?
 - b. How are evidence-based standards developed and why are they important?
7. Review understanding of learning objective: Safely manage mechanical ventilation
 - a. Describe how mechanical ventilation works.

SURVEY

Print this page and provide to students.

Students, please complete a brief (2-3 minute) survey regarding your experience with this ARISE simulation. There are two options:

1. Use QR Code: Survey

Note: You will need to download a QR Code reader/scanner onto your own device (smartphone or tablet). There are multiple free scanner apps available for both Android and Apple devices from the app store.

This QR Code will not work in the ARIS app.



2. Copy and paste the following survey link into your browser.

https://ircvtc.co1.qualtrics.com/SE/?SID=SV_6Mwfv98ShBfRnBX

APPENDIX A

ADULT MECHANICAL VENTILATION

1. POLICY

- a. The Respiratory Therapist and MD will determine mechanical ventilations settings based on each patient's ideal body weight, physical condition, and clinical condition. Clinical data will be used to determine appropriate changes to mechanical ventilation settings.

2. PURPOSE

- a. The purpose of this policy is to provide a safe and efficient mechanical ventilator setup, management and weaning.

3. SCOPE

- a. These mechanical ventilation policies support an interprofessional approach to mechanical ventilation.

4. GUIDELINES

- a. Ordering Adult Mechanical Ventilation protocols for intubated patients
 - i. The protocols will be initiated by physician order.
 - ii. Any order not covered by the protocols should be written in the physician's order sheet.
 - iii. The attending physician may discontinue the Adult Mechanical Ventilation protocols at any time.
 - iv. Any patient that meets the Adult Mechanical Ventilation protocols exclusion criteria will not be managed using the protocol.
 - 1) Exclusion criteria includes:
 - a) Patient less than 16 years old
 - b) A physician order that varies from the Adult Mechanical Ventilation protocols and does not permit adjustment of ventilator parameters based on those protocols.

ADULT MECHANICAL VENTILATION SETUP PROTOCOL

1. INITIAL PARAMETERS & GOALS

- a. Volume Ventilation is generally used for the majority of patients, but Pressure Ventilation should be considered if peak pressures are > 40 cm H₂O, or if plateau pressures rise > 30 cm H₂O.
- b. The initial Volume Ventilation settings will be determined based upon the patient's Ideal Body Weight (IBW) and immediate clinical needs.
 - i. Tidal Volume (V_T): set between 6-8 mL/Kg IBW while maintaining plateau pressure < 30 cm H₂O. Consult physician if unable to maintain these parameters.
 - 1) IBW Calculation
 - a) Males (kg) = $105 + 5 (\text{height in inches} - 60) \div 2.2$
 - b) Females (kg) = $106 + 6 (\text{height in inches} - 60) \div 2.2$
 - ii. Rate (f): set between 10 to 16 breaths/minute.
 - iii. F_IO₂: set between 0.4 to 1
 - iv. PEEP: Set initial PEEP at 5 cm H₂O, unless otherwise indicated. Higher levels may be required with acute lung injury (ALI) or acute respiratory distress syndrome (ARDS). See ALI/ARDS Protocol.
 - v. I:E Ratio: Adjust to achieve an I:E ratio greater than 1:2 – 1:3 unless otherwise indicated to provide optimum mean airway pressure, lung filling, lung emptying (minimizing airtrapping/Auto-PEEP), and patient/ventilator synchrony.
 - c. Obtain an ABG within 30 – 45 minutes from the start of mechanical ventilation and adjust above settings per Adult Mechanical Ventilation Management Protocol.

ADULT MECHANICAL VENTILATION MANAGEMENT PROTOCOL

1. INITIAL VENTILATOR & PATIENT ASSESSMENT GUIDELINES

- a. Initial ventilator and patient assessment will be performed within 15 - 45 minutes from setup.
- b. Assessment will include evaluation of the patient's general appearance, breath sounds, ventilating pressures and volumes, SpO₂, ABGs, HR, BP, ETCO (if available) and other hemodynamic data (if available).
- c. Adjust ventilator settings to achieve and maintain acceptable ABG's according to the ventilator management guidelines.

2. VENTILATOR MANAGEMENT GUIDELINES

- a. Subsequent ventilator and patient assessments will be performed and documented at least every four hours.
- b. For a pH < 7.30, evaluate to determine if the cause is respiratory.
 - i. If appropriate, increase rate to a maximum of 26 breaths/min until pH is > 7.30.
 - ii. If further adjustment is needed, incrementally increase VT until peak pressure = 40 cm H₂O or plateau pressure = 30 cm H₂O.
 - iii. If adjustments are unable to achieve and maintain desired pH within the maximum parameters, consult physician and consider allowing permissive hypercapnia.
- c. For a pH > 7.45, evaluate to determine if the cause is respiratory.
 - i. If appropriate, reduce rate to a minimum of 8 breaths/minute or until pH is < 7.45.
 - ii. After rate is decreased to 8 breaths/minute, if pH is still > 7.45, reduce volume to a minimum of 4 mL/kg IBW.
- d. PaO₂ or SpO₂ should be maintained based on the oxygenation goal: Keep PaO₂ 55-80 mmHg or SpO₂ 88-95%
 - i. Adjustments can be made on SpO₂ alone, but if ABG is available, it will supersede the SpO₂.
 - ii. Minimum PEEP = 5 cmH₂O
 - iii. Do not go above 12 cmH₂O PEEP without consulting the physician
 - iv. Hemoglobin should be checked to ensure the absence of anemia.

- v. Hemodynamic data should be checked to ensure adequate perfusion.
- vi. Consult pulmonologist and consider the ARDS/ALI protocol if:
 - 1) $\text{PaO}_2/\text{FiO}_2$ ratio is < 300 or
 - 2) Settings of $\text{FiO}_2 = 0.5$ and $\text{PEEP} = 12 \text{ cm H}_2\text{O}$ are insufficient to maintain appropriate
- e. Insert A-Line if patient requires, or is anticipated to require, more than one ABG per day.
- f. Change from a Heat Moisture Exchange (HME) unit to a heated-wire circuit within 48 to 72 hours of the initiation of mechanical ventilation.

CREDITS

Adult Mechanical Ventilation Protocol adapted from AARC – Adult Mechanical Ventilator Protocols at

https://c.aarc.org/resources/protocol_resources/documents/general_vent.pdf and

Adult Ventilator Protocols at

<http://webcache.googleusercontent.com/search?q=cache:yWLtbNDXuSYJ:www.desmondallen.com/Parent/Archived%2520Articles/Advance%2520RCP/Adult%2520Ventilator%2520Protocols.pdf+%&cd=5&hl=en&ct=clnk&gl=us>

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Medication information from National Library of Medicine: Daily Med at

<http://dailymed.nlm.nih.gov/dailymed/> Pitting Edema picture from

https://en.wikipedia.org/wiki/Heart_failure

Pitting Edema picture with cellulitis from

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Pitting Edema picture without cellulitis adapted from

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