Case Scenarios

Dr Shrikanth Srinivasan
MD,DNB,FNB,EDIC
Consultant, Critical Care Medicine
Medanta, The Medicity

Case 1

- A 36 year male with cirrhosis and active GI bleeding is intubated to protect his airway, and subsequently placed on mechanical ventilation.
- His blood pressure drops substantially soon after being placed on the ventilator. One potential mechanism for drop in this blood pressure is:

1. Decrease in preload secondary to mechanical ventilation

2. Increase in preload secondary to mechanical ventilation

3. Decrease in afterload secondary to mechanical ventilation

4. Increase in afterload secondary to mechanical ventilation

Case 2

- A 42 year female with severe bronchial asthma exacerbation is intubated and ventilated for respiratory failure. High peak pressures are noted (55 mmHg), and the plateau pressures are within normal limits. This high pressure:

1. Will be transmitted to the alveoli and is likely to result in barotrauma
2. Is not transmitted to the alveoli and is unlikely to result in barotrauma
3. Reflects alveolar overdistension
4. Could be the result of a pneumothorax

Case 3

- A 32 year otherwise healthy female is admitted for dysuria and fever in ward. A critical care consult is requested because of low blood pressure. The resident orders a 3000 cc of NS in addition to appropriate antibiotics. Patient continues to be hypotensive despite the fluids and is transferred to the ICU. Appropriate vasopressors are started. She now complains of respiratory distress. She is still hypotensive and is in obvious significant distress. ABG shows a pH 7.4, pCO2 40, HCO3 24 and SaO2 of 95% on room air. CXR is unremarkable. Regarding her respiratory status, the next appropriate step is to:

1. Place her on 100%NRB
2. Obtain another ABG and CXR in 30-60 minutes to decide further course of action. Intubate if she shows significant hypoxemia or abnormal CXR.
3. Intubate and initiate mechanical ventilation immediately

Case 3

- During rounds in the morning, a decision is made to initiate mechanical ventilation for this patient.
- Would you use noninvasive ventilation for this patient?
- Why?
- Why not?

Case 3

- Which of the following modes of mechanical ventilation will be appropriate for her?
- Which of the following modes of mechanical ventilation will **not** be appropriate for her?

1. AC/CMV
2. SIMV
3. PSV/CPAP
4. PCV
5. APRV
6. HFOV

Case 3

- She weighs 80 kg and is 5’6” tall. The recommended tidal volume for her is:

1. 1000 cc
2. 750 cc
3. 600 cc
4. 360 cc
5. None of the above.

Case 3

- She is on a Vt of 360, RR of 20, PEEP of 12 and FiO2 of 100%. Her SaO2 is 72%.

- What do you do next?

Case 3

- Use proper PEEP/FiO2 combinations

FiO_2	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.7
PEEP	5 12-14	5 14	8 16	8 16	10 18-20	10 20	10 20	12 20
FiO_2	0.7	0.8	0.9	0.9	0.9	1.0	1.0	1.0
PEEP	14 20	14 20-22	14 22	16 22	18 22	20 22	22 22	24 24

Case 3

- Appropriate changes in PEEP are made. SaO2 has now come up to 78% and the patient appears uncomfortable.

- What do you do next?

Sedate

Case 3

- Patient is comfortably sedated. SaO2 has gone up to 82%.

- What do you do next?

Paralyse (not more than 48 hours)

Case 3

- Appropriate changes are made. Now her SaO2 is 94% but the plateau pressure is 45. CXR now shows bilateral diffuse infiltrates. The next step is to:

1. Increase PEEP
2. Increase tidal volume
3. Decrease tidal volume
4. Increase respiratory rate
5. Make no changes

Case 3

- Appropriate action is taken. Two hours later, her BP is 110/75, HR 98, RR 30/minute, her plateau pressure is 29, her peak airway pressure is 35, SaO2 is 94% but the ABGs show a pH of 7.25 with a pure respiratory acidosis. The next step is to:

1. Increase tidal volume
2. Decrease tidal volume
3. Decrease rate
4. Start an IV bicarbonate infusion to maintain a pH 7.35-7.45
5. Do nothing at this point

Case 3

- Appropriate steps are taken. Later in the day the nurse calls you because of high pressure alarms on the ventilator and decreased SaO2. You notice an obviously awake patient in distress. The immediate next steps will include all ***except:***

1. Order a stat CXR and wait for the CXR before taking the next step
2. Remove patient from the ventilator and “manually bag the patient”
3. Sedate the patient to prevent asynchronous breathing and straining
4. Note the ease or difficulty in “bagging” the patient
5. Auscultate and percuss for symmetry
6. Note position of ET tube to look for migration

Case 3

- Two hours later the nurse notifies you that the peak pressure is 55 and the plateau pressure is now 32. (Pk 35 and Plt 29 before) Possible causes for this change include the following (more than one can be correct):

1. ETT migration/blockage
2. Acute bronchospasm
3. Abdominal compartment syndrome
4. Pneumothorax
5. Worsening ARDS

Case 3

- Appropriate measures are taken and the pressures return back to a peak of 35 and plateau of 29. Next AM the peak pressure is 45 and plateau pressure is 39. Possible causes for this change include (more than one can be correct):

1. ETT migration/blockage
2. Acute bronchospasm
3. Abdominal compartment syndrome
4. Pneumothorax
5. Worsening ARDS

Case 4

- A 55 year female is on AC (volume controlled) ventilation and develops a pneumothorax. The ventilator parameters that make you think of a pneumothorax include: (More than one can be correct)

1. Low peak pressures
2. High peak pressures
3. Low plateau pressures
4. High plateau pressures
5. Low tidal volumes
6. High tidal volumes

Case 5

- A 55 year female is on pressure controlled ventilation and develops a pneumothorax. The ventilator parameters that make you think of a pneumothorax include: (More than one can be correct)

1. Low peak pressures
2. High peak pressures
3. Low plateau pressures
4. High plateau pressures
5. Low tidal volumes
6. High tidal volumes

Case 6

- A 52 year male with COPD exacerbation is placed on AC, Vt 400 cc, RR 12/minute. Patient is obviously awake and is triggering the ventilator at a rate of 20/minute. No alarms on the ventilator are being triggered. The approximate minute ventilation for this patient is:

1. 8000 cc
2. 4800 cc
3. 4800 cc + an additional volume that depends on lung compliance and muscle strength
4. >8000 cc
5. Cannot be calculated based on the given information

Case 7

- A 52 year male with COPD exacerbation is placed on SIMV, Vt 400 cc, RR 12/minute, PS 5. Patient is obviously awake and is breathing at a rate of 20/minute. No alarms on the ventilator are being triggered. The approximate minute ventilation for this patient is:

1. 8000 cc
2. 4800 cc
3. 4800 cc + an additional volume that depends on lung compliance and muscle strength
4. >8000 cc
5. Cannot be calculated based on the given information

Case 8

- A 68 year male who was admitted for pneumonia is currently on mechanical ventilation (AC, Vt 360, RR 12, PEEP 5, FiO2 55%). You are concerned about the significant respiratory alkalosis that this patient has. You will address this by making the following change:

1. Increase FiO2 to decrease the respiratory drive
2. Decrease respiratory rate
3. Decrease PEEP
4. Increase sensitivity for triggering the ventilator
5. None of the above

Case 9

- A 55 year male with advanced COPD presents with respiratory distress, cough and fever. Physical examination shows a mild fever, bilateral wheezing and respiratory distress. ABGs show pO2 50, pH 7.25, pCO2 60. He is awake and able to follow commands. Steroids and bronchodilators are started. It is appropriate to place the patient on:

1. Oxygen alone
2. BIPAP
3. Invasive mechanical ventilation
4. CPAP

Case 10

- A 34 year female with urosepsis develops respiratory distress. ABGs show as pO2 of 50 on ventimask FiO2 0.5, pH of 7.25 and pCO2 of 25. She is awake and able to follow commands. Appropriate medications are started. It is appropriate to place the patient on:

1. Oxygen alone
2. Noninvasive mechanical ventilation
3. Invasive mechanical ventilation

Case 12

- A 65 year male with advanced COPD is on invasive mechanical ventilation for three days. His weaning parameters are borderline and he is extubated. He develops breathing difficulty on extubation, but no stridor. It is appropriateto place the patient on:

1. Oxygen alone
2. Noninvasive mechanical ventilation
3. Invasive mechanical ventilation

Case 13

- A 45 year female with gallstone pancreatitis and ARDS is improving and meets extubation criteria. She develops worsening respiratory distress three hours after extubation. It is appropriate to place the patient on:

1. Oxygen alone
2. Noninvasive mechanical ventilation
3. Invasive mechanical ventilation

Case 14

- A 55 year male with advanced COPD presents with respiratory distress, cough, fever and wheezing. Physical examination shows bilateral wheezing and moderate respiratory distress. He is awake and responsive. ABG shows pH 7.25, pO2 50 and pCO2 60. The appropriate management for this patient includes:

1. Oxygen alone
2. Noninvasive mechanical ventilation on floor
3. Noninvasive mechanical ventilation in ICU
4. Invasive mechanical ventilation

Case 14

- A decision is made to place patient on NPPV. Two hours later he is feeling better. ABG shows pH 7.35, pCO_2 50 and pO_2 75. The next step is to:

1. Continue current management
2. Initiate invasive ventilation
3. Discontinue NPPV

Case 14

- Three hours later the patient is unresponsive and uncooperative. Physical examination shows bilateral wheezing and respiratory distress. ABG shows pH 7.30, pCO2 55 and pO2 75. The next step is to:

1. Continue current management
2. Initiate invasive ventilation
3. Discontinue NPPV

Case 14

- This patient is now intubated. Choose appropriate settings with regards to:

1. Mode
2. FiO2
3. Rate
4. Vt
5. T pause
6. Peak flows

- Describe how each of these settings differ from those chosen for a patient with ARDS.

Case 15

- During weaning, a patient is found to have a Vt of 400 cc and a RR of 20. The RSBI (Rapid Shallow Breathing Index) for this patient is:

1. 20
2. 8000
3. 50
4. Cannot be calculated based on the information available

Case 16

- A 67 year female is admitted to the ICU for urosepsis and ARDS. On the fifth ICU day she is afebrile and appears awake and comfortable. She is on zosyn, vancomycin, lovenox, nexium, dopamine (15mcg/kg/min), versed and fentanyl. She is on AC, Vt 360cc, PEEP 5, FiO2 35%, RR 16/min. Weaning parameters show a NIF of -65 and RSBI of 45.

1. Should this patient be extubated?
2. Why/Why not?

Case 17

- A 25 year old Tech student is admitted to the ICU after a Friday night celebration. He is found to be intoxicated and is placed on mechanical ventilation because of hypoventilation and inability to protect airway. Next AM he is wide awake, comfortable and physical exam and labs are within normal limits.

– Describe the weaning protocol you would use for this patient.

Case 18

- A 75 year old male is admitted with pneumonia and ARDS. On the sixth admission day, he is afebrile and appears awake and comfortable. He is on zosyn, vancomycin, lovenox, nexium, versed and fentanyl. He is on AC, Vt 340cc, FiO2 75%, RR 16/min, PEEP 12.5. Weaning parameters show a NIF of -75 and a RSBI of 44.
  - Should this patient be extubated?
  - Why/Why not?

Case 19

- A 45 year male with cirrhosis is admitted for alcohol withdrawal and is intubated for airway protection. Three days later, he is no longer agitated. He is hemodynamically stable and the labs are all within normal limits. The ativan drip that patient was on has been discontinued and he is unarousable. His SaO2 is 99%. He is on AC,
- Vt 400 cc, RR 18/min, FiO2 25%, PEEP 5. Weaning
- parameters show a RSBI of 35.
- – Should this patient be extubated?
- – If not, give reasons why.

Case 20

- A 34 year male with progressive GBS (bulbar) is intubated because of inability to protect airway and severe respiratory acidosis. Ten days later, his neurological condition has not deteriorated further and is unchanged otherwise. He is afebrile, awake and looks quite comfortable. He is hemodynamically stable, has a clear CXR and has very good oxygenation.

– Describe the weaning protocol you would use for this patient.

Case 21

- A 45 year male with aspiration pneumonia is admitted for respiratory failure. He is intubated and placed on mechanical ventilation. 7 days later, he is hemodynamically stable, off vasopressors, and has a SaO_2 of 94% on a FiO_2 of 35%. He tolerates PSV, PS 5cm and PEEP 5cm for 2 hours. Weaning parameters show a NIF of -55,Vt of 200 cc and RR of 40.

– Should this patient be extubated?

– If not, give reasons why.

Case 22

- A 35 year female with ARDS continues to be hypoxic on CMV, RR 20, Vt 360cc, FiO2 100%, PEEP 22 and Tpause 1.0. Plateau pressure is 30 and peak pressure is 36. A decision is made to initiate APRV. What ventilator settings would you use for this patient:
- P-high
- P-low
- T-high
- T-low

- A 35 year female with ARDS continues to be hypoxic on CMV, RR 20, Vt 360cc, FiO2 100%, PEEP 22 and Tpause 1.0. Plateau pressure is 30 and peak pressure is 36. A decision is made to initiate APRV. What ventilator settings would you use for this patient:
- P-high = 30
- P-low = 0
- T-high = 5
- T-low = 0.5 (Adjust to keep T-PEFR 50-75%)

Case 24

- A 35 yr old man with status epilepticus following organochloride ingestion is being ventilated in the ICU. You are called because of desaturation and persistent low pressure alarms. How would you tackle the situation?

Consider the following

- Cuff leak.
- Leak in the circuit
- Loose connections
- ET tube displacement
- Disconnection
- Inadequate flow
- Low supply gas pressures

Low pressure alarm

- FiO2 to 100%
- Check all connections for leaks. Start from ventilator inspiratory outlet—humidifier—inspiratory limb—nebulizer—Y junction—dead space—et tube cuff—expiratory limb—expiratory valve.
- If inspiratory effort excessive-inadequate flow—increase inspiratory flow, decrease Ti, increase TV
- Check gas pressures
- If all normal and problem persists, change ventilator