Case Presentation:
An 80-year-old man with a history of hypertension, atrial fibrillation, congestive heart failure with preserved ejection fraction, and sacral decubitus ulcer was hospitalized for surgical debridement of his ulcer.

Hospital Course
- The patient developed health-care associated pneumonia and was treated with antibiotics and aggressive hydration.
- His pneumonia resolved within a few days, however the patient started complaining of difficulty breathing and cough with a new oxygen requirement of 3L/min via nasal cannula.
- His chest imaging showed bilateral pleural effusions refractory to diuresis (Fig 1).
- The patient underwent right-sided thoracentesis, with removal of 2.5L of transudative fluid.
- He witnessed immediate improvement in his breathing, and the chest x-ray post-thoracentesis showed significant reduction in the right pleural effusion. (Fig 2)
- Later that night, the patient developed dyspnea and hypoxia. On physical exam, he was tachypneic, tachycardic and his oxygen saturation was 67% on 3L/min via nasal cannula.
- Lung auscultation revealed new crackles on the right side extending to the apex, and remained unchanged on the left side.
- Repeated chest x-ray showed diffuse right-sided infiltrates, consistent with re-expansion pulmonary edema. (Fig 3)
- The patient was admitted to the intensive care unit and received BiPAP ventilation, as well as diuresis.
- Repeated imaging within five hours demonstrated significant reduction in the pulmonary edema, and the patient’s clinical condition improved markedly. (Fig 4)
- He was transitioned to supplemental oxygen via nasal cannula at 2L/min within 24 hours.

Case Report
- Cannula at 2L/min within 24 hours.
- Patient’s clinical condition improved markedly. (Fig 4)
- Received BiPAP ventilation, as well as diuresis.
- Consistent with re-expansion pulmonary edema. (Fig 3)
- Extending to the apex, and remained unchanged on the left side.
- Surgical debridement of his ulcer.

Learning Objectives
- Identify patient with re-expansion pulmonary edema (RPE) post-thoracentesis.
- Describe the management of a patient with re-expansion pulmonary edema.

Radiological Studies
- Fig 1: Pre-thoracentesis X-ray showed bilateral pleural effusions with bibasilar infiltrates.
- Fig 2: Post-procedure X-ray showed decreased right pleural effusion with patchy airspace disease on the right side without any definite pneumothorax. There is persistent moderate left pleural effusion.
- Fig 3: This X-ray was performed four hours after the previous study and showed complete opacification of the right hemothorax without any pneumothorax. It is consistent with re-expansion pulmonary edema.
- Fig 4: This X-ray was performed six hours after the previous image and showed partial clearing of the edema of the right lung compared to the previous examination.

Discussion
- Re-expansion pulmonary edema (RPE) is a rare complication of therapeutic thoracentesis.1,2,3,7
- The high mortality rate, reported up to 20%, presses the issue for finding adequate prevention and treatment.7
- Recent studies have shown a correlation between the amount of volume removed from the pleural cavity and the risk of developing RPE. In addition, the severity of the intra-pleural negative pressure is thought to contribute to the risk of developing RPE.1,3
- Patients usually present with productive cough, tachypnea, hypoxia, tachycardia, and hemodynamic instability within the first hour and up to twenty four hours after the procedure.5
- Chest imaging usually shows unilateral pulmonary congestion and edema at the site of the procedure, or contra-laterally in extremely rare cases.1,6
- Treatment for RPE is supportive, with oxygen supplementation and diuresis.5
- In our case, we found dramatic clinical and radiological changes after applying BiPAP and thereby increasing the intra-pleural pressure.
- Clinicians should be encouraged to place patients who develop RPE on BiPAP for six to twelve hours to prevent worsening of pulmonary edema.
- As presented in our case, this management modality had desirable outcomes in as little as five hours.

Conclusion
BiPAP could be an effective way in treating patient with RPE by increasing the intra-pleural pressure. Further studies should be conducted to assess the effectiveness of BiPAP in decreasing the progression of RPE and mortality.

References

Learning Objectives
- Identify patient with re-expansion pulmonary edema (RPE) post-thoracentesis.
- Describe the management of a patient with re-expansion pulmonary edema.

Radiological Studies
- Fig 1: Pre-thoracentesis X-ray showed bilateral pleural effusions with bibasilar infiltrates.
- Fig 2: Post-procedure X-ray showed decreased right pleural effusion with patchy airspace disease on the right side without any definite pneumothorax. There is persistent moderate left pleural effusion.
- Fig 3: This X-ray was performed four hours after the previous study and showed complete opacification of the right hemothorax without any pneumothorax. It is consistent with re-expansion pulmonary edema.
- Fig 4: This X-ray was performed six hours after the previous image and showed partial clearing of the edema of the right lung compared to the previous examination.

Discussion
- Re-expansion pulmonary edema (RPE) is a rare complication of therapeutic thoracentesis.1,2,3,7
- The high mortality rate, reported up to 20%, presses the issue for finding adequate prevention and treatment.7
- Recent studies have shown a correlation between the amount of volume removed from the pleural cavity and the risk of developing RPE. In addition, the severity of the intra-pleural negative pressure is thought to contribute to the risk of developing RPE.1,3
- Patients usually present with productive cough, tachypnea, hypoxia, tachycardia, and hemodynamic instability within the first hour and up to twenty four hours after the procedure.5
- Chest imaging usually shows unilateral pulmonary congestion and edema at the site of the procedure, or contra-laterally in extremely rare cases.1,6
- Treatment for RPE is supportive, with oxygen supplementation and diuresis.5
- In our case, we found dramatic clinical and radiological changes after applying BiPAP and thereby increasing the intra-pleural pressure.
- Clinicians should be encouraged to place patients who develop RPE on BiPAP for six to twelve hours to prevent worsening of pulmonary edema.
- As presented in our case, this management modality had desirable outcomes in as little as five hours.

Conclusion
BiPAP could be an effective way in treating patient with RPE by increasing the intra-pleural pressure. Further studies should be conducted to assess the effectiveness of BiPAP in decreasing the progression of RPE and mortality.

References