**The heart of the Problem: From Heart Attack to Kidney Failure**

Adapted from <http://sciencecases.lib.buffalo.edu/cs/files/left_heart.pdf>

**Part I –** Emergency Mrs. Helms came in through the front door of her house with an armful of groceries. She put the bag down on the kitchen counter and called to her husband. “Herb, I’m home! Are you ready for lunch?” She didn’t get an answer, so she walked to the living room and found Mr. Helms lying on the floor. “Herb! Are you okay?” she asked as she grabbed his shoulder. Mr. Helms responded weakly while clutching his chest. Mrs. Helms frantically called 911. It only took EMS a few minutes to arrive and the paramedics transported Mr. Helms to the hospital. Upon admission to the hospital, Mr. Helms’ vital signs were recorded as follows:

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| --- | --- | --- |
|  | Normal levels | Mr. Helms |
| Systolic BP (mm Hg) | 120 | 90 |
| Diastolic BP (mm Hg) | 80 | 52 |
| Oral temperature | 97.8-99.1 | 98.9 |
| Heart rate (bpm) | 60-80 | 120, irregular |
| Respiratory rate (per min) | 12-20 | 33, labored |
| Oxygen saturation | 95=100% | 89% |

After examination and an echocardiogram, Dr. Collins spoke with Mrs. Helms. “I’m very sorry, but your husband has had another heart attack resulting in valve failure. A papillary muscle that controls a valve in the left ventricle of his heart has been severely damaged and is no longer working.”

1. What is the function of the papillary muscle? What valve specifically do you think is being affected and why?
2. Research and describe two additional blood tests could be ordered to test for heart attack?

Dr. Collins called Nurse Nan from the patient’s room and confided, “Mr. Helms is in bad shape. His left posteromedial papillary muscle was damaged from his heart attack. The papillary muscle is no longer able to maintain closure of the valve, and this has resulted in mitral valve prolapse. With decreasing cardiac output, this patient is in for a fight for his life.” Nurse Nan knew that maintaining cardiac output was necessary for adequate blood flow through the body. As Dr. Collins walked away, Nurse Nan composed herself to tell Mrs. Helms the bad news and returned to the patient’s room. Nurse Nan explained to Mrs. Helms that her husband had left-sided heart failure and that his blood pressure was slowly and steadily decreasing.

1. Why is the blood flow in the heart being impacted?
2. How does mitral valve prolapse decrease cardiac output? (You might need to know what Cardiac output is)
3. Why is Mr. Helm’s heart rate higher than normal?

Mrs. Helms was very upset with the news of her husband’s condition. As the day progressed, she noticed that Mr. Helm’s breathing was increasingly difficult. He could barely speak without losing his breath. Mrs. Helms called the nurse to her husband’s room. “My husband can’t breathe! What is wrong? I thought he had a heart attack not a respiratory condition!” Nurse Nan auscultated the patient’s chest listening to Mr. Helms’ respirations, which were rapid and wet, producing rales or crackling sounds. Nurse Nan calmly informed Mrs. Helms, “I’m sorry. Your husband’s condition is worsening. The damage to his heart is causing his respiratory problems.”

1. Mr. Helms is suffering from pulmonary edema, producing the symptom of increasingly labored breathing and lung rales when the doctor listens to his breathing. How did his mitral valve prolapse lead to this condition? Be specific!
2. Research and briefly describe how each treatment option for MVP could improve his outlook:
   1. Diuretics
   2. Heparin
   3. Ring annuloplasty

The next morning when Nurse Nan started her shift, she immediately checked on Mr. Helms. His cardiovascular and respiratory conditions were still deteriorating, but Nurse Nan discovered something new. Mr. Helms’ urine output was almost nonexistent. Nurse Nan informed Dr. Collins, who was gravely concerned. Dr. Collins met with Mrs. Helms to tell her that her husband could not survive kidney failure. Mrs. Helms looked shocked. She then became very upset and angry. “What did you do, Dr. Collins? My husband had a heart attack, but his kidneys were fine; he’s never had a kidney problem! How could you let this happen?” Nurse Nan put her arm around Mrs. Helms’ shoulders and Dr. Collins handed her a tissue. Dr. Collins explained, “The damage to your husband’s heart is very serious. The kidneys rely on blood pressure to work and his heart failure is causing the kidney failure.” Dr. Collins rushed Mr. Helms into surgery for valve replacement. Mrs. Helms waited anxiously in the waiting area for family for hours until she saw Nurse Nan coming toward her with a big smile. “Your husband is in the recovery room. He’s going to be just fine.” Mrs. Helms sighed with relief and gave Nurse Nan a big hug.

1. Compare these symptoms with right sided heart failure. What are the similarities and differences? Be specific
2. What is the prognosis after a mitral valve replacement surgery?
   1. Risk of death? –
   2. Length of recovery (in general)-
   3. What lifestyle changes will you have to make?
   4. What is the length of time that the replaced mitral valve can be expected to last?