Case #1 for Heart Failure Pathophysiology Seminar

Mrs. ER is a 71 year old female who is admitted to the hospital for aortic valve replacement. She has a history of diabetes mellitus and a known heart murmur for years. She has had a progressive decline in her functional capacity, such that she has difficulty with her ADLs (activity of daily living). She underwent an echocardiogram which revealed the following:

**Echocardiogram:**
Normal left ventricular size and function. Aortic cusps are severely thickened. Doppler interrogation demonstrated a peak velocity of 5.2 m/sec which calculated to a peak instantaneous pressure gradient of 107 mmHg. Valve excursion is severely restricted. There is severe aortic stenosis.

She subsequently underwent a cardiac catheterization which revealed the following:

There was no angiographic evidence for occlusive coronary artery disease. Ejection Fraction (EF) was estimated at 55%. There was severe aortic stenosis.

Open the TEACH Program and the open the Aortic Stenosis Case. Record the following hemodynamic values:

- **Arterial Blood Pressure:**
- **Left Ventricular Systolic Pressure:**
- **Difference between Left Ventricular and Aortic Blood Pressure**
- **Left Ventricular End Diastolic Pressure**
- **Left Ventricular End Diastolic Volume**
- **Left Ventricular End Systolic Volume**
- **Left Ventricular Stroke Volume**
- **Left Ventricular Cardiac Output**

The patient is admitted and given IV lasix of 20 mg once. She begins to feel better. Later that evening you are called because the nurse notes that her blood pressure is low, BP=100/60 with a HR of 65 bpm.

To recreate the clinical scenario in TEACH do the following: (1) reduce the blood volume from +250 ml to -250 ml and reduce the heart rate from 85 to 65 bpm. After the program reaches a steady state, record the following:

- **Arterial Blood Pressure:**
- **Left Ventricular Systolic Pressure:**
- **Difference between Left Ventricular and Aortic Blood Pressure**
- **Left Ventricular End Diastolic Pressure**
- **Left Ventricular End Diastolic Volume**
- **Left Ventricular End Systolic Volume**
- **Left Ventricular Stroke Volume**
- **Left Ventricular Cardiac Output**

What are the major changes in her hemodynamic values after diuretics? Why has her blood pressure dropped? Has her valve stenosis changed?
Case #2 for Heart Failure Pathophysiology Seminar

Mr. A.C. is a 60 year old male with an ischemic cardiomyopathy and at baseline NYHA Class III, Stage C heart failure who is admitted for progressive shortness of breath and fatigue. On exam his blood pressure is 110/65, pulse is 80, respiratory rate of 24, and oxygen saturation of 94% on 2 liters supplemental oxygen. He has an elevated jugular venous pressure of 7 cm, rales 1/3 the way up both lung fields, a regular cardiac rhythm with a third heart sound, II/IV low pitched systolic murmur at the left ventricular apex, liver that is 3 cm below the costal margin and 2+ symmetric peripheral edema. A previous echo shows a dilated left ventricular with an ejection fraction of <25%.

He is admitted to the hospital for further management.
Open the TEACH Program and the open the Systolic Heart Failure Case. Record the following hemodynamic values:

Arterial Blood Pressure:
Left Ventricular Systolic Pressure:
Left Ventricular End Diastolic Pressure
Left Ventricular End Diastolic Volume
Left Ventricular End Systolic Volume
Left Ventricular Stroke Volume
Left Ventricular Cardiac Output

You institute medical management of the patient who is in decompenated heart failure. Specifically, you give intravenous diuretics (which reduce the plasma volume and hence blood volume) and you give Dobutamine (an inotrope) that increases contractility.

Using the TEACH Program, determine the effects of both of these maneuvers by filling in the following chart. To determine the effects of diuretics reduce the blood volume from 1000 ml to 500 ml. To determine the effect of dobutamine, increase contractility from 1.0 mm Hg/ml to 2.0 mm Hg/ml.

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<tr>
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<th>Baseline</th>
<th>Diuretics</th>
<th>Dobutamine</th>
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<td>Arterial Blood Pressure:</td>
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<tr>
<td>LV End Diastolic Pressure</td>
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<td>Cardiac Output</td>
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<td>Ejection Fraction</td>
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