**Small Group Worksheet — Cases**

**Case 1**: A 50-year-old woman with a history of hypertension and diabetes presents to her primary care office for a routine visit. She denies any dyspnea, weight gain, lower extremity edema, orthopnea or paroxysmal nocturnal dyspnea (PND). She has no lower extremity edema or distended neck veins. Cardiac exam reveals normal heart sounds.

**Case 2**: A 50-year-old woman with a history of hypertension and diabetes presents to her PCP office with several weeks of increasing dyspnea on exertion and lower extremity edema. She has started sleeping at an angle due to shortness of breath at night. She denies any weight gain or PND. She has JVD, lower extremity edema and normal heart sounds on exam.

**Case 3**: A 50-year-old woman with a history of hypertension and diabetes presents to the emergency department with several weeks of increasing dyspnea on exertion and lower extremity edema. She has started sleeping at an angle due to shortness of breath at night. She denied any known weight gain or PND. She has lower extremity edema, JVD, and a third heart sound on exam.

**Questions:**

1. What is your overall clinical impression that the patient has heart failure (Yes/No)?

*Encourage residents to make their best judgment with the limited information provided in the vignette, and without thinking in detail about the math (which they will do in the following questions!) What is their gestalt? Is their pattern recognition kicking for this case?*

*Case 1: No*

*Case 2: Yes*

*Case 3: Yes*

1. What is your estimate of your patient’s pretest probability for heart failure (hint: consider risk factors and clinical setting)? Compare your estimate with the numbers provided in Table 1.

*Encourage the group to expand on the first impression that they made in question 1 and start to back it up and put a number on the probability. Make sure the residents actually put a number to paper- making a commitment and getting immediate feedback from looking at the table will enhance learning!*

*For all cases, the pre-test probability guesses will probably vary, but should be based on history (presence of risk factors) and whether the patient is presenting in the outpatient versus the ED setting. Note that these probabilities don’t take the additional history pieces (except for shortness of breath) or exam findings into consideration. More on that shortly.*

1. Use the likelihood ratios provided in Table 2 to determine how the pre-test probability of heart failure changes with your exam findings.

*Case 1: 7% 🡪 5% with LR 0.64 (no edema) 🡪 3% with LR 0.64 (no JVD) 🡪 2.5% with LR 0.88 (no S3)*

*Case 2: 27% 🡪 65% with LR 5.1 (JVD) 🡪 80% with LR 2.4 (edema) 🡪 78% with LR 0.88 (no S3)*

*Case 3: 50%: 50% 🡪 90% with LR 11 (S3) 🡪 98% with LR 5.1 (JVD) 🡪 99% with LR 2.4 (edema)*

*These numbers are all estimates using the likelihood ratio nomogram provided to students. Using a straight edge of a piece of paper, have the students draw a straight line starting at their pretest probability, intersecting at the likelihood ratio of the test, and ending on a new posttest probability.*

1. Based on your initial pretest probability estimate, would you perform serum BNP testing to evaluate for heart failure? Why or why not? What would you estimate the LR of BNP testing to be for heart failure in this patient?

*Groups may have different opinions about this. Most likely:*

*Group 1: No, likely because they are convinced there is no heart failure*

*Group 2: Yes, because there is still significant ambiguity*

*Group 3: No, because they feel confident in their diagnosis of heart failure*

*Elicit from residents what they would predict the LR of BNP to be before looking at the table. Point out to the students the differences in LRs between the different exam maneuvers- S3 is great (LR 11), LE edema less so (LR 2.4), and as compared to the LR values for BNP. Are they surprised how the BNP stacks up against the exam components? This is also a good time to point out the LR of initial clinical gestalt (4.4) and tie back to their initial impressions from question 1.*

1. Using your estimated pretest probability of disease, use the likelihood ratios in Table 3 to assess how BNP testing might influence your posttest probability of disease in your patient. Consider BNP results of <50, >= 100, and >= 200 (pg/ml).

*\*If you are running low on time, you can have residents use an online post-test probability calculator instead of using the nomogram. Example:* [*http://www.sample-size.net/post-probability-calculator-test-new/*](http://www.sample-size.net/post-probability-calculator-test-new/)

*Group 1: 2.5% 🡪 4% with < 50 (LR 1.7)*

*🡪 6.5% with >=100 (LR 2.7)*

*🡪 8.5% with >=200 (LR 3.7)*

*Group 2: 78% 🡪 86% < 50 (LR 1.7)*

*🡪 90% with >=100 (LR 2.7)*

*🡪 93% with >=200 (LR 3.7)*

*Group 3: 99% 🡪 > 99% < 50 (LR 1.7)*

*🡪 > 99% with >=100 (LR 2.7)*

*🡪 > 99% with >=200 (LR 3.7)*

*Discuss how these results reinforce (or possibly conflict with) the decisions they came up with for answer 4. As a closing, point out the LR of initial clinical gestalt (4.4!). Highlight the importance of coming up with an initial clinical impression and then using evidence to help support or refute that position. This is System 1 (pattern recognition) and System 2 (deliberate hypothetical deduction) in practice!*

*At the end of the exercise, have the groups report out a summary of their findings, i.e. “We had a patient with several risk factors for CHF coming into outpatient clinic with no symptoms of heart failure and a normal exam. Our initial gestalt was that she did not have heart failure. Based on the risk factors we estimated her risk to be 10%, which was close to the 7% listed in the table. The probability of CHF decreased using LRs for her lack of exam findings, ending up at 2.5%. We were confident in this diagnosis so did not want to order a BNP. This was confirmed by our calculations, which showed that if her BNP came back > 200, her post-test probability would still only be about 8.5%, not enough to pursue further diagnostic testing like an echo.”*

**Table 1. Pretest Probabilities for Heart Failure in Different Clinical Settings**

**(based on overall prevalence of heart failure in that population)**

|  |  |
| --- | --- |
| Patients presenting to PCP asymptomatic  | 2% |
| Patients presenting to PCP asymptomatic, with at least 1 risk factor (HTN, DM, MI, angina, etc.) | 7% |
| Patients with suspected heart failure in PCP setting  | 27% |
| Patients with dyspnea in the ED setting  | 50% |

**Table 2. Likelihood Ratios for Physical Exam Findings:**

|  |  |
| --- | --- |
| Overall initial clinical gestalt  | (+) 4.4 , (-) 0.45 |
| Lower extremity edema  | (+) 2.4, (-) 0.64 |
| Jugular venous distension  | (+) 5.1, (-)0.64  |
| Third heart sound  | (+) 11, (-) 0.88  |

**Table 3. Likelihood Ratios for BNP Testing:**

|  |  |
| --- | --- |
| BNP Level (pg/ml) | Likelihood Ratio  |
| < 50 | (+) 1.7, (-) 0.06 |
| >= 100 | (+) 2.7, (-) 0.11 |
| >= 200 | (+) 3.7, (-) 0.11 |

**Adapted from:**

Wang CS, Fitzgerald JM, Schulzer M, et al. Does this dyspneic patient in the emergency department have congestive heart failure? *JAMA*. 2005;294:1944-1956.

**Likelihood Ratio**

