**Facilitator’s Guide**

**Description**: This guide is intended to help the faculty deliver this 56-minute discussion to fellows on the topic of use of biostatistics in diagnostic testing, screening, and treatment.

**Learning Objectives**:

1. Explain basic statistical concepts for diagnostic testing: sensitivity and specificity, predictive values, and likelihood ratios.
2. Describe the impact of pretest probability and test characteristics on clinical decision making.
3. List the elements of a high-value screening test.
4. Link these basic statistical concepts to the practice of high-value care.
5. Apply the following statistical tools to make high-value treatment decisions: risk ratios, absolute and relative measures, and numbers needed.

**Audience and Setting**:The intended audience members for this module are fellowship trainees.

**Equipment Required**: A computer with projector for PowerPoint presentation with audio output, a white board or flip chart for recording group work, and internet connection so trainees can use their devices and follow links to tools. Make copies for all participants of the case and likelihood ratios handouts for the first small group session.

**References**:

1. Choosing Wisely statements (relevant to each fellowship training)
2. *Specific for cardiovascular fellowship*:

Appropriate Use Criteria (developed and sponsored by American College of Cardiology)

* 1. Echocardiography
  2. Nuclear cardiology imaging
  3. Cardiac catheterization

*Specific to Oncology fellowship*:

High Value Concepts regarding cancer screening literature (see reference 4 below)

1. ACP/AAIM High Value Care Curriculum for IM residency
2. Wilt TJ, Harris RP, Qaseem A; High Value Care Task Force of the American College of Physicians. Screening for cancer: advice for high-value care from the American College of Physicians. Ann Intern Med. 2015 May 19;162(10):718-25. [PMID: 25984847]

**Presentation Instructions**:

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| Step | Description | Estimated Time |
| 1 | Welcome participants, introduce speaker, and identify the reasons for the discussion, including:   * Physicians should know statistical concepts and understand how to apply them to support high value care decisions when considering diagnostic and screening tests and proposed treatments * Describe the link between basic statistical concepts and high-value care * Review the Learning Objectives (slide 2) | 3 minutes |
| 2 | Briefly review essential biostatistical concepts (slides 3 to 7), including sensitivity, specificity, and positive and negative predictive values. | 7 minutes |
| 3 | Demonstrate how to use these concepts to inform diagnostic decision making:   * Emphasize the importance of pretest probability and that diagnostic testing is most helpful in patients with intermediate pretest probability (slides 8, 9) * Define likelihood ratios and explain how they may be used BEFORE testing to estimate the effect of testing on posttest probability of disease (slides 10 to 15) | 5 minutes |
| 4 | Small Group Exercise (slide 16, plus Module 3 case and LR handouts): Applying likelihood ratios to clinical scenarios to identify high and low value testing  Ask participants to use the clinical scenarios, likelihood ratios, and nomograms provided to decide whether the test offered is high or low value.  Review the list of common likelihood ratios for tests and physical exam findings.  Ask them to share what they learned from the exercise with the larger group. | 10 minutes |
| 5 | Role of screening tests and common harms and limitations associated with diagnostic testing and screening (slides 17 to 23) | 7 minutes |
| 6 | Screening value cases   * Choose from 3 or 4 cases and decide whether or not to screen. | 7 minutes |
| 7 | Biostatistics in Treatment (slides 24 to 28)   * Define High Value Therapeutic Decision Making. * Define common terms used to describe therapeutic benefit/harm. * Identify the three preferred terms for communicating treatment effect: absolute risk, absolute risk reduction, and numbers needed. | 7 minutes |
| 8 | Cost effectiveness (slides 29, 30)   * Define Quality-Adjusted Life-Year (QALY) and <$100,000 as the historical QALY threshold in the U.S. * Compare QALYs for common treatments and ask if any of these numbers surprise the fellows. * Ask the fellows if they know the QALY associated with common screening tests or therapeutic interventions in their specialties. | 5 minutes |
| 9 | Summary (slides 31, 32)   * Emphasize the importance of using biostatistical principles to make informed decisions on diagnostic testing, screening, and treatment. * The limitations (lack of sensitivity/specificity) and cost effectiveness of screening tests, as well as patient’s goals, should be taken into account before ordering. * Recommendations are not prescriptive, but rather the beginning of an open dialogue with patients to create a prioritized care plan as a team. | 5 minutes |