Test Performance Characteristics and Basic Statistics

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# Key Concepts

<table>
<thead>
<tr>
<th>Basic -1</th>
<th><strong>Diagnostic Test Accuracy</strong></th>
<th>Population, sampling, null and alternative hypotheses, type I and II errors</th>
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<tbody>
<tr>
<td></td>
<td>Sensitivity, specificity, PPV, NPV</td>
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<tr>
<td>Basic -2</td>
<td>ROC curves and summary indices derived from them</td>
<td>p-values, confidence intervals, correlation, agreement</td>
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<tr>
<td>Intermediate -1</td>
<td>Study design, MRMC studies, blinding, randomization, biases</td>
<td>Study designs, RCTs, paired/unpaired designs, biases</td>
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<tr>
<td>Intermediate -2</td>
<td>Chi square test, McNemar’s test, reader agreement</td>
<td>Chi square test, t-tests, paired t-tests, Wilcoxon test</td>
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<tr>
<td>Advanced -1</td>
<td>Sample size calculations for proportions, ROC area</td>
<td>Sample size calculations for proportions, means</td>
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<tr>
<td>Advanced -2</td>
<td>Screening studies – design, biases, outcome measures</td>
<td>ANOVA, linear and logistic regression</td>
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## Suggested Readings:

<table>
<thead>
<tr>
<th>Basic -1</th>
<th><strong>Diagnostic Test Accuracy</strong></th>
<th><strong>Statistical Concepts</strong></th>
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</thead>
<tbody>
<tr>
<td>Level</td>
<td>References</td>
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</table>
| Intermediate - 2 | 1. Dawson and Trapp, Chapter 6  
3. Pagano, Chapter s 15 and 16. |

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</table>
3. Dawson and Trapp, chapter 6 |
2. Dawson and Trapp, Chapter s 7 and 8.  
3. Pagano, Chapter 12,17,18 |

Additional references for clinical research:

1: Grimes DA, Schulz KF.
   An overview of clinical research: the lay of the land.
   PMID: 11809203 [PubMed - indexed for MEDLINE]

2: Grimes DA, Schulz KF.
   Descriptive studies: what they can and cannot do.
   PMID: 11809274 [PubMed - indexed for MEDLINE]

3: Grimes DA, Schulz KF.
   Bias and causal associations in observational research.
   PMID: 11812579 [PubMed - indexed for MEDLINE]

4: Grimes DA, Schulz KF.
   Cohort studies: marching towards outcomes.
   PMID: 11830217 [PubMed - indexed for MEDLINE]

5: Schulz KF, Grimes DA.
   Case-control studies: research in reverse.
   PMID: 11844534 [PubMed - indexed for MEDLINE]

6: Schulz KF, Grimes DA.
   Generation of allocation sequences in randomised trials: chance, not choice.
   PMID: 11853818 [PubMed - indexed for MEDLINE]

7: Schulz KF, Grimes DA.
   Allocation concealment in randomised trials: defending against deciphering.
   PMID: 11867132 [PubMed - indexed for MEDLINE]

8: Schulz KF, Grimes DA.
   Blinding in randomised trials: hiding who got what.
   PMID: 11879884 [PubMed - indexed for MEDLINE]

9: Schulz KF, Grimes DA.
   Sample size slippages in randomised trials: exclusions and the lost and wayward.
   PMID: 11888606 [PubMed - indexed for MEDLINE]

10: Grimes DA, Schulz KF.
    Uses and abuses of screening tests.
    PMID: 11897304 [PubMed - indexed for MEDLINE]

11: Schulz KF, Grimes DA.
    Unequal group sizes in randomised trials: guarding against guessing.
12: Schulz KF, Grimes DA.
Sample size calculations in randomised trials: mandatory and mystical.
PMID: 15823387 [PubMed - indexed for MEDLINE]

13: Grimes DA, Schulz KF.
Compared to what? Finding controls for case-control studies.
PMID: 15836892 [PubMed - indexed for MEDLINE]

14: Grimes DA, Schulz KF.
Refining clinical diagnosis with likelihood ratios.
PMID: 15850636 [PubMed - indexed for MEDLINE]

15: Schulz KF, Grimes DA.
Multiplicity in randomised trials I: endpoints and treatments.
PMID: 15866314 [PubMed - indexed for MEDLINE]

16: Schulz KF, Grimes DA.
Multiplicity in randomised trials II: subgroup and interim analyses.
PMID: 15885299 [PubMed - indexed for MEDLINE]