ESSENTIAL COMPETENCIES FOR MEDICAL STUDENTS AS MEDICAL EDUCATION RESEARCHERS
SDRME 2010 – EDITORS FERGUSON AND HUGGETT

BACKGROUND & PURPOSE
Although medical students may have opportunities to develop research competencies specific to scientific and clinical research, it is less likely they will have formal opportunities to learn about and conduct medical education research. At the 2010 Society of Directors of Research in Medical Education annual meeting we sought to outline the competencies essential for students who wish to participate in medical education research.

METHODS
SDRME members reviewed a list of medical education research competencies derived from the task force report “Review Criteria for Research Manuscripts” edited by Bordage and Caelleigh and published in Academic Medicine (2001). We used discussion and iterative review to determine, by consensus, which competencies should be addressed, either as required or recommended. The required competencies were those that could be accomplished in a one-month rotation, while the recommended competencies were believed to require a longer time period (perhaps a three-month summer fellowship). Finally, there were two competencies adapted from the Bordage and Calleigh article on which the group could not reach consensus in terms of whether they should be required or recommended.

RESULTS

<table>
<thead>
<tr>
<th>ESSENTIAL COMPETENCIES FOR MEDICAL EDUCATION RESEARCH</th>
<th>Required</th>
<th>Recommended</th>
<th>Corresponding Bland Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Define a focused research question in a larger area of interest</td>
<td>✔️</td>
<td></td>
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<tr>
<td>2. Access prior research and interpret it in context of the research question – recognize that most questions build on existing research and gaps in the literature that add to the body of research</td>
<td>✔️</td>
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<tr>
<td>3. Understanding the conceptual/theoretical framework underlying the question</td>
<td>✔️</td>
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<td>4. Identify types of methods in medical education research, especially as they contrast with biomed research paradigms</td>
<td>✔️</td>
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<td>5. List and describe the steps in the research process, particularly for educational research</td>
<td>✔️</td>
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<td>6. Critically appraise literature by applying published criteria relevant to the research paradigm (e.g., Acad Med checklist)</td>
<td>✔️</td>
<td></td>
<td>Bland #11 and #12</td>
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</table>
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<tr>
<td>7. Operationalize dependent and independent variables and develop a research design for their research question – including basics of data management</td>
<td>✓</td>
<td></td>
<td>Bland #13</td>
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<td>8. Identify and differentiate inductive (observational) and deductive (interventional) approaches to examining a research question</td>
<td>✓</td>
<td></td>
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<tr>
<td>9. Distinguish the similarities and contrasts between social/educational research and biomedical research</td>
<td>✓</td>
<td></td>
<td></td>
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<tr>
<td>10. Compare and contrast quality criteria for different paradigms/genres of research</td>
<td></td>
<td>✓</td>
<td>Bland #14</td>
</tr>
<tr>
<td>11. Design and carry out a small study (including data analysis, reporting and presentation of results)</td>
<td></td>
<td>✓</td>
<td>Bland #15 and 16</td>
</tr>
<tr>
<td>12. Data management principles</td>
<td></td>
<td>✓</td>
<td>Bland #17</td>
</tr>
</tbody>
</table>

**FOR FURTHER DISCUSSION**

The group was not able to reach consensus on the following competencies:
- Be able to select conceptual models for various research procedures OR recognize variations in logic models for various research procedures.
- How much and when to introduce analytic procedures, both quantitative and qualitative.

Brief discussion of the Bland competencies for research centered on the similarities of the competencies to those adapted from Bordage and Calleigh. The discussion suggests that some of the corresponding Bland competencies would be considered required, while others would be recommended. An educational strategy deemed helpful in accomplishing the required competencies would be to identify a body of educational research that exemplified the principles being taught (e.g., literature related to admissions procedures, burn-out and empathy, or clinical evaluation forms).

**REFERENCES**


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RESEARCH (from Bland Competencies)

11 Access and critically read the research literature in medicine, education, and other domains.

12 Understand theory and empirical findings in one's own research area.
   - Identify an area of interest in a given body of literature
   - Identify experts in that area of interest
   - Use appropriate resources to complete literature searches; be familiar with available software packages to search (Medline, Grateful Med.)
   - Evaluate a research article critically
   - Explain the importance of theory to research
   - Relate specific questions of interest to underlying theory
   - Pursue an area of interest over an extended period of time, remaining current in pertinent literature
   - Recognize the classic studies, traditional designs, common forms of measurement, common variables, and common methodological problems related to their own research content
   - Critically synthesize the literature relevant to a particular research question
   - Identify the professional conferences and organizations that focus on this area in their agendas and missions

13 Formulate a research question and operationalize variables.
   - Identify a problem or general question to investigate
   - Refine the problem so it can be investigated
   - Establish a clear purpose to the research
   - Translate the general question into specific hypotheses, recognizing, the difference between research, null, and alternative hypotheses
   - Define variables and terms operationally
   - Recognize the difference between independent and dependent variables when applicable
   - Determine how each variable will be measured, recognizing different levels of measurement
   - Evaluate the reliability and validity of a given instrument
   - Evaluate variables and their measurement in one's area of research and know how they compare to other similar measures

14 Design descriptive and/or explanatory studies.
   - Categorize research design (e.g., observational/interventional, prospective/retrospective)
   - State the purpose, strengths, and limitations of each design
   - Compare major types of studies, such as case reports, case controls, cross-sectional, longitudinal, and epidemiological studies, clinical trials, survey studies, field research, and evaluation studies
   - Explain important threats to internal and external validity applicable in each design
   - State the relationship between the chosen research design, the type of data collected, and the necessary statistical techniques
   - Prepare for and use consultation from design specialists
   - Thoroughly analyze the dominant research designs used in one's special area of study
   - Recognize sources of error in one's study and methods to minimize error when possible
15 ___ Collect and analyze data.
   - Distinguish inferential from descriptive statistics
   - Determine the universe, population, appropriate sample, sample size, and appropriate sampling technique for a given study
   - Understand basic statistical concepts such as: statistical significance, mean, median, mode, standard deviations, standard error, prevalence rate, incidence rate, and p-value
   - Understand commonly used statistical tests, such as chi-square, t-test, analysis of variance, correlations, and multiple regression
   - Construct a plan for managing data files and for analyzing those data according to their level of measurement and the research design
   - Be familiar with available statistical packages (e.g., SPSS-X, SAS, BMD) to direct computer personnel in what analysis to use and what related decisions must be made
   - Interpret printouts from available statistical packages for one’s research study
   - Understand how to graphically summarize and communicate data in an efficient manner
   - Report results correctly, and be able to cite strengths and limitations of the study based on data
   - Prepare for and use consultation from computer analysts and statisticians
   - Understand more advanced statistical tests used in one's special research area, such as discriminant analysis, principal components analysis, multiple logistic analysis

16 ___ Evaluate and discuss study findings.
   - Explain the outcomes of given analyses in terms of the originally stated hypothesis
   - Conduct additional literature review as needed to elaborate upon findings and their implications for a given body of research
   - Integrate the research findings into the existing literature by discussing what is known, unknown, and requires further study
   - Express appropriate cautions in interpreting results, and base these cautions on methodological and theoretical conditions
   - Place one’s study in the context of existing research and justify how it contributes to important questions in the area

17 ___ Manage research projects.
   - Develop plans for implementing a study, including timeline, budget, requirements for personnel, facilities, and supplies exist for monitoring and planning a research project
   - Identify appropriate funding sources (local, state, national)
   - Identify faculty collaborators from within and outside the discipline who can offer guidance to the project
   - Hire, manage, and evaluate personnel involved with a study
   - Prepare and submit required reports, budget requests, and other administrative documents
   - Secure permission from human subjects, research, & other institutional review committees/boards
   - Implement and direct a research project
   - Prepare a research proposal suitable for submission to one’s research area

____ List Additional Goal/s in the research domain which are important to you but not listed above (if possible, include specific objectives for each goal. Use back for more space.):