FLORIDA STATE UNIVERSITY
COLLEGE OF MEDICINE

Research Workshop Series #3
Research Design I
The Research Process

Steps of the Research Process:
- Find a Research Idea
- Convert Idea into Hypothesis
- Define Variables, Choose Measures
- Identify Participants
- Select a Research Design
- Conduct the Study
- Analyze the Data
- Report the Results
- Refine or Reformulate Your Idea
Research Protocol

• A written plan of the study

• Documents the objectives, design, methodology, statistical considerations, and organization of the clinical study

• Addresses the protection of human subjects and integrity of the data collected
Protocol Components

- Research Topic & Question
- Background/ Literature Review
- Research Objectives
- Hypotheses
- Study Methods
- Independent & Dependent Variables
- Subject Selection/Inclusion & Exclusion Criteria
- Study Implementation Planning
- Data Management and Statistical Analysis
- References

*Additional components required for clinical drug trials*
“Hourglass” Notion of Research

Begin with Broad Questions

Narrow Down & Focus

Operationalize

INVESTIGATE

Analyze Data

Draw Conclusions

Generalize & Disseminate
Research Topic & Question
Selecting a Research Topic

• Building your research portfolio

• Insert your own passion and goals

• Assess your own knowledge, skills, & abilities

• Consider collaborators with additional expertise
Formulating your research question

• Research topic should be an **answerable** question

• Should not be too broad or too narrow

• Evidence-based frameworks to assist in mapping question

• Organize the topic into a concept and assign terms to each concept to combine in a search strategy

• Essential characteristics: “**FINER**”  
  Feasible, Interesting, Novel, Ethical, and Relevant
Formulating your research question

<table>
<thead>
<tr>
<th>✓ Problem</th>
<th>disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Population</td>
<td>age</td>
</tr>
<tr>
<td>✓ Intervention</td>
<td>education</td>
</tr>
<tr>
<td>✓ Setting</td>
<td>school</td>
</tr>
<tr>
<td>✓ Service provider</td>
<td>health educator</td>
</tr>
<tr>
<td>✓ Methods/Theories of interest</td>
<td>study design (e.g., cohort study)</td>
</tr>
<tr>
<td>✓ Outcome(s) of interest</td>
<td>reduced risk</td>
</tr>
</tbody>
</table>
Formulating your research question


- Bragge, P. (2010). Asking good clinical research questions and choosing the right study design. *Injury, 41*, S3-S6

PICO Method

• Popular framework in medical research

• Used for clearly defined clinical questions
PICO Exercise

• How would you frame this research question?
  • Does hand washing among healthcare workers reduce hospital acquired infections?

<table>
<thead>
<tr>
<th>P</th>
<th>patients with a hospital acquired infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>hand washing</td>
</tr>
<tr>
<td>C</td>
<td>no hand washing</td>
</tr>
<tr>
<td>O</td>
<td>reduced rates of hospital acquired infection</td>
</tr>
</tbody>
</table>
Evaluating Research Questions

• What are the effects of childhood obesity in the U.S.?
  o Too broad

• How are schools addressing childhood obesity?
  o Difficult to operationalize

• What are the obesity rates among middle school students in Tallahassee, Florida?
  o Too narrow

• What are the effects of physical activity programs in middle schools on the rates of childhood obesity among 7th grade students?
  o Best question – requires an investigation & evaluation
Background &
Literature Review
Background

• What is known about the topic at hand?

• Cites previous research that is relevant

• Indicates gaps with prior research & what uncertainties remain

• Specifies how study will help fill gaps & lead to new scientific knowledge
Why conduct a literature review?

• To evaluate existing research
• To describe other research
• To identify gaps in the literature
• To relate to your own research to existing research
• To identify ideas and information relevant to your own research
Literature Review Overview

THE LITERATURE SEARCH PROCESS:

1. Articulate topic to research
2. Select database/formulate search strategies
3. Run searches/manage citations
4. Review citations; if needed, modify search or topic
5. Conduct original research/write article/create poster/present findings, etc.

[Diagram showing the steps of the literature search process]
Health Sciences Databases

Subject-specific Databases

- PubMed
- Cochrane Library
- PsycINFO
- CINAHL Plus with Full Text

Interdisciplinary Databases on Multiple Subjects

- Web of Science
- Google Scholar
How to search effectively:

1. Determine your research question & main concepts
2. Choose databases (subject or type of information)
3. Search standard language in database (e.g., MeSH)
4. Identify keyword (synonyms) + MeSH terms
5. Create search strings of similar terms for each concept using OR combine search strings of each concept using AND
MeSH

What is MeSH?

• Medical subject headings
• Standard terminology/descriptors
• Defines term + hierarchy in relation to other terms
• Refines the search to relevant records

MeSH Database

• Search term
• Select subheading
• Restrict to major topic
• Review entry terms for other keywords
• Add MeSH term to search builder
Running the Search

- look at # of results
- Display Settings → Abstract
- save citations to email, citation manager, Clipboard, My NCBI, etc.
- use limits (filters)
- review # of results as limiting search
Citation Management Tools

Advantages:

• Useful for managing & organizing several literature sources
• Allows you to build your own library for your research topic
• Simplifies creating a bibliography (auto-generate)
• Allows sharing references with peers
• Provides recommendations for sources
• Ability to change citation formats to fit journal submission requirements

Reference Managers:

• EndNote
• RefWorks
• Mendeley
• Zotero
• CiteULike
• JabRef
How would you frame the research question we discussed earlier using MeSH terms in PubMed?

Example Research Question:
What are the effects of physical activity programs on childhood obesity among 7th grade students?
Research Objectives & Hypotheses
Research Objectives

Objectives

• Should answer these questions:
  o Why does this research need to be done?
  o What will this study accomplish?
  o What will be its relevance?

• Simple, specific, and stated in advance

*Example:

• To evaluate the effects of physical activity programs on middle school students
• To examine the rates of childhood obesity among 7th grade students
Hypotheses Development

• A prediction about the relationship between two or more variables
  o An expected answer to a study question
  o Establishes the basis for tests of statistical significance

• A study may have one or more hypotheses

• Qualitative research is often used for hypotheses generation
Hypothesis Examples

• Increased frequency of hand washing among health care workers is related to a reduction in hospital acquired infections

• Middle school students that participate in at least 3 hours of physical activity per week have lower rates of obesity compared to students that are less active

• Drug A combined with Drug B will increase the incidence of psychosis in elderly patients
Thank you!

Questions & Discussion