

Brown University
Department of Emergency Medicine
Providence, RI 02903-4923

RESEARCH SKILLS

Course Syllabus

Sep 2015 – May 2016

3rd and 4th Tuesdays of the month

10:30 AM – 12:00 PM

Claverick Building

Co-Director		Co-Director	
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Course Description

As part of a dedicated and formal effort to have a concise uniform research education for various non-ACGME fellowships under the Department of Emergency Medicine, this curriculum is designed. The target audience is Emergency Medicine fellows and fourth year Emergency Medicine residents who may want to do a research track during their residency. Various sessions will be conducted over time that will allow achieving the following objectives:

1. To learn core research principles over the fellowship training time period by participating in a core curriculum teaching.
2. To learn principles of conducting research, writing for Institutional Review Board, and writing of a manuscript.

Additional goals and objectives will be identified by various program directors including:

1. To identify a main research area of interest during the first few months of fellowship.
2. To identify primary or secondary mentorship and conduct well designed research.
3. To complete a manuscript in a timely manner.

Course Outline

The course consists of eighteen 1.5-hour sessions offered twice a month. The sessions include didactic presentations with half an hour of in class scenario discussions to outline the achievement of session objectives. There will be some take home tasks and writing involved to further aid in learning. The topics of the course include (but are not limited to): (a) designing a study; (b) types of studies; (c) study methodology design; (d) sampling designs and statistical tools for data analysis (e) analysis of data and results; (f) risk assessment and presentation; (g) statistical tests of probability; (h) association and causality; (i) understanding bias, limitations, and confounders; (j) survey designs and methodology; (k) qualitative research methodology; (l) large data set studies; (m) meta-analysis; (n) research interventions; (o) writing a quality manuscript; (p) using online resources and software for manuscript writing; (q) ethics in clinical research.

Lecture Schedule

Date Lecture

9/22/15 Designing a Study

Geoff Capraro, MD, MPH

Assistant Professor, Department of Emergency Medicine

Objectives:

- a. Understand how to formulate a study question and defend its need
- b. Understand hypothesis generation and defining study objectives
- c. Null and alternate hypothesis
- d. Precision and accuracy to identify and formulate study hypothesis

9/29/15 Types of Studies

Tracy Madsen, MD, ScM

Assistant Professor, Department of Emergency Medicine

Objectives:

- a. Understand various research study types, their selection based on the study question, advantages and limitations associated with each
- b. Understand which study type can be used for hypothesis testing
 - i. Descriptive/Observational/Case series
 - ii. Case-Control
 - iii. Cohort: Prospective and Retrospective
 - iv. Randomized Control Trials
 - v. Phase 1-4 studies

10/20/15 Study Methodology Design

Michael Mello, MD, MPH

Director of the Injury Prevention Center

Professor, Departments of Emergency Medicine & Health Services, Policy & Practice

Objectives:

- a. Understand how to design a study
- b. Identifying the population of interest and appropriate sample methodology
- c. Identifying outcome of interest
- d. Data collection, variables of interest, coding and entering

10/27/15 Sampling Designs and statistical tools for Data Analysis

Janette Baird, PhD

Associate Professor (Research), Department of Emergency Medicine

Objectives:

- a. Sample size calculations, limitations, inclusion and exclusion criteria
- b. Statistical tools for sample size estimation
- c. Statistical tools and applications for data analysis
- d. Designing study analysis before data collection

11/17/15 Analysis of Data and Results - Part 1

Alison Riese, MD

Assistant Professor, Department of Emergency Medicine

Objectives:

- a. Planning the analysis
- b. Presentation of study population: demographics and differences between groups
- c. Presentation of basic data: types of variables (ordinal, nominal, discrete, categorical and continuous)
- d. Estimation of central tendency (mean, median, mode)
- e. Proportions

11/24/15 Analysis of Data and Results - Part 2

Thomas Chun, MD, MPH

Associate Professor, Department of Emergency Medicine

Objectives:

- a. Understanding use of various statistical methods for continuous and categorical data
- b. Use of chi square statistics, t-test, Wilcoxon rank test, ANOVA test
- c. Study errors: alpha, beta
- d. Power of study estimation
- e. Test of significance: use of p-value

12/22/15 Risk Assessment and Presentation

Siraj Amanullah, MD, MPH

Associate Director, PEM Fellowship Research and Research Education

Assistant Professor, Departments of Emergency Medicine and Pediatrics

Objectives:

- a. Understand the concept of risk assessment to determine association
- b. Use of various risk estimates based on various study types
- c. Odds ratio, relative risk, hazard ratios: utility and methods of calculation
- d. Attributable risks
- e. Disease measurements: prevalence, incidence, morbidity, mortality rates

12/29/15 Statistical Tests of Probability

Linda Brown, MD, MSCE

Assistant Professor, Department of Emergency Medicine

Objectives:

- a. Understand concept of probability assessment of various clinical tests
- b. Sensitivity, specificity, false negative and positive rates
- c. Negative and positive predictive values
- d. ROC and Area Under the Curve

1/19/16 Association and Causality

Siraj Amanullah, MD, MPH

Associate Director, PEM Fellowship Research and Research Education

Assistant Professor, Department of Emergency Medicine

Dale Steele, MD, MS

Associate Professor, Departments of Emergency Medicine and Pediatrics

Objectives:

- a. Understanding the difference between association and causality
- b. Confounders and ways to assess risk while controlling for confounders
- c. Regression analysis for continuous, binomial, and categorical data
- d. Survival analysis: basic concepts

1/26/16 Understanding Bias, Limitations, and Confounders

Frances Turcotte-Benedict, MD, MPH

Assistant Professor, Department of Emergency Medicine

Objectives:

- a. Understand various limitations and bias inherent to study design and introduced by researchers
- b. Understanding of confounders and effect on risk assessments
- c. Methodologies to control for confounders and measurement of effect

2/16/16 **Survey Designs & Methodology**

Janette Baird, PhD

Associate Professor (Research), Department of Emergency Medicine

Neha Raukar, MD, MS

Director of the Division of Sports Medicine

Assistant Professor, Department of Emergency Medicine

Objectives:

- a. Understand utility of surveys for various study designs
- b. Designing of surveys and methodology to create instrument and administration
- c. Sample size estimation for survey design
- d. Validation of survey, analysis, and presentation of results

2/23/16 **Qualitative Research Methodology**

Aris Garro, MD, MPH

Assistant Professor, Department of Emergency Medicine

Objectives:

- a. Understand utility of qualitative research methods
- b. Designing of qualitative research methodology
- c. Analysis and presentation of qualitative research methods

3/22/16 **Large Data Set Studies**

Roland C. Merchant, MD, MPH, ScD

Associate Professor, Departments of Emergency Medicine & Epidemiology

Objectives:

- a. Identifying utility of large data sets for study designs
- b. Various methodologies to use large data sets and extraction of variable of interests
- c. Understanding analysis and presentation of results
- d. Defining limitations associated with use of large data sets for research purposes
- e. Examples of national online available large data sets

3/29/16 **Meta-Analysis**

Dale Steele, MD, MS

Associate Professor, Departments of Emergency Medicine and Pediatrics

Objectives:

- a. Principles of conducting meta-analysis
- b. Advantages and limitations of meta-analysis
- c. Methodology, inclusion and exclusion of studies
- d. Interpretation of meta-analysis findings

4/5/16 **Research Interventions**

Megan Ranney, MD, MPH

Director of the Emergency Digital Health Innovation Program

Assistant Professor, Department of Emergency Medicine

Objectives:

- a. Designing of research interventions
- b. Defining variables and various point of time while administering intervention to study population
- c. Understand limitations associated with intervention based research designs

4/26/16 **Writing a Quality Manuscript**

Gregory Jay, MD, PhD

Vice Chair for Research

Professor, Departments of Emergency Medicine, Medicine & Engineering

Elizabeth Goldberg, MD

Assistant Professor, Department of Emergency Medicine

Objectives:

- a. How to summarize research in an abstract
- b. Defining need for the study in introduction
- c. Describing research methods for reproducibility and concise to the study question
- d. Presentation of results related to study hypothesis
- e. Discussion of major study findings without repeating results but more a continuum and likely explanation of study findings in lieu of available literature
- f. Closing the discussion with limitations and future directions

5/24/16 **Use of various online resources and software for manuscript writing**

Christopher Merritt, MD, MPH

Assistant Professor, Department of Emergency Medicine

Objectives:

- a. Medline search
- b. Transfer of abstracts to various reference software: EndNote/Refworks
- c. Using of reference software while writing manuscript

5/31/16 **Ethics in Clinical Research**

Deidre Fearon, MD

Associate Professor, Department of Emergency Medicine

James Linakis, MD, PhD

Associate Medical Director, Hasbro Children's Hospital Emergency Department

Professor, Departments of Emergency Medicine & Pediatrics

Chair, Institutional Review Board, Rhode Island Hospital

Objectives:

- a. Informed consent
- b. Blinding
- c. When to terminate a research: stops points
- d. Assent, dissent and consent