

2008 UIC Emergency Medicine Residency Research Course
Research Hypothesis Development
Edward P. Sloan, MD, MPH, FACEP

Conducting Successful EM Resident Research:
Generating Research Ideas and Hypotheses

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2008 UIC Research Course


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Disclosures

- **FERNE Chairman and President**
- **ACEP Clinical Policy Committee**
- **ACEP Scientific Review Committee**

- **No individual financial disclosures**

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Background to a Research Project

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Physician

A Doctor of Medicine

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Why Conduct Research?

- Curiosity.
- Improve Patient Care.
- Improve medical education.
- Make clinical practice more interesting.
- Career enhancement.
- Stay employed.

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Research

Scholarly or scientific investigation or inquiry.

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Study

Research, detailed examination, and/or analysis of an organism, object or phenomena.

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What do we as physicians do?

- Prevent disease.
- Diagnose disease.
- Treat disease.
- Research to prevent further disease.
- Do no harm.
- Improve public health.
- Improve the healthcare system.
- Educate young physicians.

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So what can we research?

- Epidemiology.
- Diagnostic tests.
- Disease treatment.
- Lifestyle vs. disease.
- Iatrogenic disease.
- Public health.
- Cost, quality, and access.
- Physician education.

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The Research Perspective

- CIA model.
- Information control.
- Analyzing the past.
- Predicting the future.
- Shaping the future.
- Ball bearing factory model.

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A “Realistic” Approach

- Nothing is as it seems.
- Slow and steady wins.
- Build one brick at a time.
- All work is flawed.
- All work has value.
- The Walkman model.

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A “Realistic” Approach

- What to study? What they’ll pay for.
- Work with the end product in mind.
- Thinking like a researcher.
- Feeling it in your gut.

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Developing a Research Idea and Hypothesis for Study

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Idea Development

Objective: To find simple answers to important questions.

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Idea Development

- Question what others do.
- Question the medical literature.
- Do a quick chart review.
- Review the literature.
- Ask the hard questions early.
- Clarify the question.
- Propose a simple answer.

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Reviewing the Literature

- Be critical and systematic.
- Go to the best articles, use their references.
- Use the Index Medicus.
- Do a computer search.

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Hypothesis

A supposition put forth based on the known facts... which serves as a starting point for further investigation... so that the true theory can be established.

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Null Hypothesis

The hypothesis to be tested, denoted by H_0 .

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Alternative Hypothesis

The hypothesis accepted when the null hypothesis is rejected, denoted by H_a .

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Hypothesis Testing

The process of providing evidence for accepting or rejecting the null hypothesis (H_0).

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Hypothesis Development

Objective: To clearly state what is being proven and disproved by the research.

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Alternate Hypothesis (Ha) Development

Objective: To clearly state the quantifiable difference between two groups that the research will study.

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Epidemiology: Head Injuries in Bicyclists

- **Bad:** Head injuries are on the rise
- **Good:** 1990 head injuries are 5x>than 1980

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Diagnostics: Pulse Oximetry in Pulmonary Embolism

- **Bad:** Low pulse ox readings suggest PE
- **Good:** Patients with a pulse ox value <90 have a 4x higher PE rate than those >90

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Treatment: Acute Asthma and Aminophylline

- **Bad:** Aminophylline helps in acute asthma
- **Good:** Patients who receive IV aminophylline have a 25% lower admission rate than those without

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Lifestyle: Cigarettes and Pulmonary Disease

- **Bad:** Cigs cause kids to have pulmonary disease
- **Good:** ED visits for URI's are 2x higher in kids whose parents smoke than those who do not

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Iatrogenic: Central Catheters and Pneumothorax

- **Bad:** Catheter ABC causes pneumothoraces
- **Good:** Rates of complication using catheter XYZ are 2x lower than rates using other catheters

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Public Health: Conflict Resolution & Violence

- **Bad: Conflict resolution will prevent violence**
- **Good: School-taught conflict resolution will decrease urban teen deaths by 25% in 3 years**

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Cost: Abdominal Stab Wound Management

- **Bad: Observation is cheaper than laprotomy**
- **Good: Patients observed have a similar outcome with a 50% reduction in medical costs**

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Medical Education: USMLE and Grading Frequency

- **Bad: USMLE scores improve as grading frequency increases**
- **Good: Changing from semi-annual testing to bi-monthly testing improves USMLE I scores > 50pts**

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Conclusions

- **Develop hypothesis that are specific.**
- **Used numbers to quantify change.**
- **Base change on specific intervention.**
- **Address the health of the public.**
- **Relate hypotheses to ways in which to improve the health of the public.**

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Conclusions

- **Do research to impact pt care.**
- **Improve your own clinical practice.**
- **Find relevant issues.**
- **Ask interesting questions.**
- **Answer the questions.**
- **Move on.**

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Thank you.

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