

**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**

*UIC EM Residency Program  
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**Disclosures**

- FERNE Chairman and President
- ACEP Clinical Policy Committee
- ACEP Scientific Review Committee
  
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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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## Research Hypothesis Development

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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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