

---

**Research Lecture:  
Basic Statistics**

Edward P. Sloan, MD, MPH, FACEP



---

**Edward P. Sloan, MD, MPH FACEP**

*Professor*

*Department of Emergency Medicine  
University of Illinois College of Medicine  
Chicago, IL*

Edward P. Sloan, MD, MPH, FACEP



---

**Attending Physician  
Emergency Medicine**

*University of Illinois Hospital  
Our Lady of the Resurrection Hospital*

**Chicago, IL**

Edward P. Sloan, MD, MPH, FACEP



---

**Disclosures**

- FERNE Chairman and President
- ACEP Clinical Policy Committee
- ACEP Scientific Review Committee
  
- No individual financial disclosures

Edward P. Sloan, MD, MPH, FACEP



---

**A Sound Statistical  
Approach**

Edward P. Sloan, MD, MPH, FACEP



---

**Basic Statistics:  
The Three Things  
You Need to Know  
In Order to Complete  
Your Project**

Edward P. Sloan, MD, MPH, FACEP



### ***Three Things to Know***

- What measurement?
- What question?
- How to report your results

Edward P. Sloan, MD, MPH, FACEP



### ***Other Things to Know***

- What data is needed?
- Basic statistical tests
- How to report?

Edward P. Sloan, MD, MPH, FACEP



### ***Two Measurements***

- Proportion
- Mean

Edward P. Sloan, MD, MPH, FACEP



### ***Two Questions***

- What is the number?
- Do two groups differ?

Edward P. Sloan, MD, MPH, FACEP



### ***Proportion Measurement***

- What % of patients had an outcome?
- Divides a group into subgroups (lived, died)

Edward P. Sloan, MD, MPH, FACEP



### ***Mean Measurement***

- Describes a characteristic of a patient group
- (mean age)
- Provides an overview

Edward P. Sloan, MD, MPH, FACEP



### ***What is the Number?***

- Describes one group
- Tells a story
- No comparisons

Edward P. Sloan, MD, MPH, FACEP



### ***What #? Confidence Interval***

- Can we believe the results?
- Was the process acceptable?
- Are the results reproducible?

Edward P. Sloan, MD, MPH, FACEP



### ***Confidence Interval***

- 95% CI
- Provides a range
- The “real” number is in this range

Edward P. Sloan, MD, MPH, FACEP



### ***Do Two Groups Differ?***

- Compares two groups
- Attempts to detect differences
- Relates outcomes to different interventions

Edward P. Sloan, MD, MPH, FACEP



### ***Groups Differ? Hypothesis Test***

- Null hypothesis,  $H_0$
- Alternate hypothesis,  $H_A$
- Are the groups the same ( $H_0$ ) or different ( $H_A$ )?

Edward P. Sloan, MD, MPH, FACEP



### ***Hypothesis Test***

- We reject  $H_0$
- The groups aren't the same
- We then accept that they differ

Edward P. Sloan, MD, MPH, FACEP



### **Using Statistics**

- 1) Pick your number type  
(Proportion or mean)
- 2) Decide what you will do  
(Describe or compare)  
(CI or hypothesis test)
- 3) Do the stat analysis
- 4) Report the results

Edward P. Sloan, MD, MPH, FACEP



### **Reporting Proportions: 95% Confidence Interval**

- In patients with T-wave inversion on their ED EKG, 29 ( $\pm$  3)% will develop an AMI during hospitalization (95% CI 26-32%).

Edward P. Sloan, MD, MPH, FACEP



### **Reporting Proportions: Hypothesis Test**

- There was a two-fold greater 5 year survival rate in drug A patients vs. drug B patients (30% vs. 15%,  $p < .001$ )

Edward P. Sloan, MD, MPH, FACEP



### **Reporting Means: 95% Confidence Interval**

- The mean CPK-MB in ED T-wave inversion AMI patients was  $12 \pm 6$  (95% CI=9-15).

Edward P. Sloan, MD, MPH, FACEP



### **Reporting Means: Hypothesis Test**

- Drug A patients had a 50% greater survival time than that of drug B patients
- $1.5 \pm 0.7$  years vs.  $1.0 \pm 0.5$  years,  $p < .001$ .

Edward P. Sloan, MD, MPH, FACEP



### **Statistics: Proportions**

- Chi-square
- Fisher's Exact test
- Logistic regression analysis

Edward P. Sloan, MD, MPH, FACEP



## Statistics: Means

- Students' t-test
- ANOVA
- Linear regression analysis

Edward P. Sloan, MD, MPH, FACEP



## Conclusions

- Simple questions
- Simple stats
- Clinically relevant reporting of the results and statistics is essential
- Complex analyses often not needed

Edward P. Sloan, MD, MPH, FACEP



## Recommendations

- Keep it simple
- Enjoy the statistics process
- Report in a way that will lead to greater understanding and clinical impact
- Improve patient care

Edward P. Sloan, MD, MPH, FACEP



*Thank you.*

[www.ferne.org](http://www.ferne.org)  
[ferne@ferne.org](mailto:ferne@ferne.org)

[edsloan@uic.edu](mailto:edsloan@uic.edu)  
312 413 7490

ferne\_2007\_research\_lecture\_sloan\_basic\_statistics\_111207\_finalcd  
12/12/2007 12:44 PM

Edward P. Sloan, MD, MPH, FACEP

