
Conducting Successful EM Resident Research: *Basic Statistics*


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Disclosures


- FERNE Chairman and President
- ACEP Clinical Policy Committee
- ACEP Scientific Review Committee
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A Sound Statistical Approach

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

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Three Things to Know

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

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Other Things to Know

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

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Two Measurements

- Proportion
- Mean

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Two Questions

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

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Proportion Measurement

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

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Mean Measurement

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

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What is the Number?

- Describes one group
- Tells a story
- No comparisons

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What #? Confidence Interval

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

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Confidence Interval

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

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Do Two Groups Differ?

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

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Groups Differ? Hypothesis Test

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

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Hypothesis Test

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

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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

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Reporting Proportions: 95% Confidence Interval

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

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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%, $p < .001$)

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Reporting Means: 95% Confidence Interval

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

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Reporting Means: Hypothesis Test

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

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Statistics: Proportions

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

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Statistics: Means

- Student's t-test
- ANOVA
- Linear regression analysis

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Conclusions

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

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Recommendations

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

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Thank you.

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