Test Taking Strategies for BPS Exams

Conquering the Biostatistics Question

Anthony J. Busti, MD, PharmD, MSc, FNLA, FAHA

HIGH-YIELD
MED REVIEWS

Disclaimer

- High-Yield Med Reviews has no working relationship with BPS (Board of Pharmacy Specialities)
- This live webinar event is not endorsed or sponsored by BPS or anyone other then High-Yield Med Reviews
- This is not meant to be a commercial or sales pitch

HIGH-YIELD
MED REVIEWS

Introduction

Anthony Busti, MD, PharmD, MSc, FNLA, FAHA

HIGH-YIELD
MED REVIEWS

Agenda

- A General Overview
- Part 1 – Conquering the Biostatistics Question
- Part 2 – Interpreting Statistical Results Correctly
- A Special Coupon Code
- Live Q&A

HIGH-YIELD
MED REVIEWS

Participation Required

You Must Fill in Some Blanks

HIGH-YIELD
MED REVIEWS

Tackling the Biostatistics Question

A Quick Recap – Initial Steps

HIGH-YIELD
MED REVIEWS

Conquering the Biostatistics Question

- Essential steps and decision points
  1. Consider drawing out study design in question
  2. How many groups are being studied?
     a. Are those groups related or independent of each other?
  3. What type of data is represented in the outcome of interest (i.e., nominal, ordinal, continuous)?
  4. Connect the row and column on summary table
  5. The Killer Foil Moment → If "applicable" results/data are available, consider the following:
     a. How many patients are in each group?
     b. Does it appear to be parametric or nonparametric?

HIGH-YIELD MED REVIEWS

Tackling the Biostatistics Question

Memorize this Chart

HIGH-YIELD MED REVIEWS

Type of Data	Two Independent Samples	Related or Paired Samples	3 or more Independent Samples	3 or more Related Samples	Measures of Correlation
Nominal	1.Chi-square 2.Fisher's Exact	McNemar Test	Chi-square for k independent samples	Cochran Q	Contingency coefficient
Ordinal	1.Mann-Whitney U 2.Wilcoxon Rank Sum	1.Sign test 2.Wilcoxon Signed Rank	Kruskal-Wallis one way ANOVA	Freidman 2 way ANOVA	1.Spearman 2.Kendal rank 3.Kendal Coe
Continuous	1.Student's t-test 2.Mann-Whitney U	Paired t-test	1-way ANOVA	2-way ANOVA	Pearson's Correlation

Tackling the Biostatistics Question

Interpreting the Statistical Results Correctly

HIGH-YIELD MED REVIEWS

The New England Journal of Medicine

Copyright © 2002 by the Massachusetts Medical Society

VOLUME 347 NOVEMBER 14, 2002 NUMBER 20

DEXAMETHASONE IN ADULTS WITH BACTERIAL MENINGITIS

JAN DE GANS, PH.D., AND DIEDERIK VAN DE BEEK, M.D., FOR THE EUROPEAN DEXAMETHASONE IN ADULTHOOD BACTERIAL MENINGITIS STUDY INVESTIGATORS*

ABSTRACT

Background Mortality and morbidity rates are high among adults with acute bacterial meningitis, especially those with pneumococcal meningitis. In studies of bacterial meningitis in animals, adjuvant treatment

THE mortality rate among adults with acute bacterial meningitis and the frequency of neurologic sequelae among those who survive are high, especially among patients with pneumococcal meningitis.[1,2] Unfavorable neurologic

Treatment

Patients were randomly assigned to receive dexamethasone sodium phosphate (Oradexon), at a dose of 10 mg given every six hours intravenously for four days, or placebo that was identical in appearance to the active drug. The study medication was given 15 to 20 minutes before the parenteral administration of antibiotics. After the interim analysis, the protocol was amended to allow administration of the study medication with the antibiotics.

Balanced treatment assignments within each hospital were achieved with the use of a computer-generated list of random numbers in blocks of six. The code was not broken until the last patient to be enrolled had completed eight weeks of follow-up. Treatment

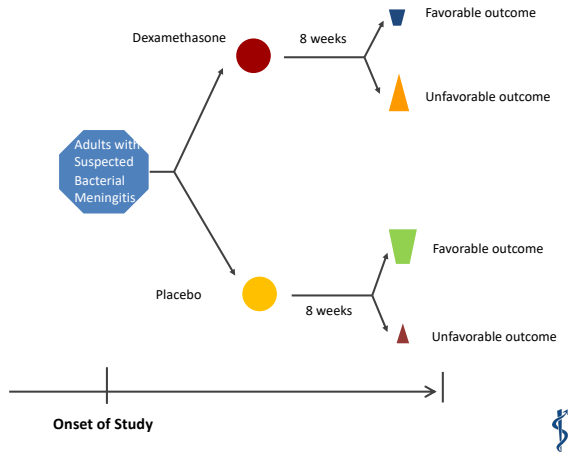
N Engl J Med 2002;347:1549-56.

N Engl J Med 2002;347:1549-56.

Dexamethasone – Adult Meningitis Study

Assessment of Outcome

The primary outcome measure was the score on the Glasgow Outcome Scale eight weeks after randomization, as assessed by the patient's physician. A score of 1 indicates death; 2, a vegetative state (the patient is unable to interact with the environment); 3, severe disability (the patient is unable to live independently but can follow commands); 4, moderate disability (the patient is capable of living independently but unable to return to work or school); and 5, mild or no disability (the patient is able to return to work or school).[12] A favorable outcome was defined as a score of 5, and an unfavorable outcome as a score of 1 to 4. The Glasgow Outcome Scale has frequently been used in trials involving stroke and other brain injuries. It is a well-validated scale with good interobserver agreement.[13,14]



N Engl J Med 2002;347:1549-56.

HIGH-YIELD MED REVIEWS

Type of Data	Two Independent Samples	Related or Paired Samples	3 or more Independent Samples	3 or more Related Samples	Measures of Correlation
Nominal	1.Chi-square 2.Fisher's Exact	McNemar Test	Chi-square for k independent samples	Cochran Q	Contingency coefficient
Ordinal	1.Mann-Whitney U 2.Wilcoxon Rank Sum	1.Sign test 2.Wilcoxon Signed Rank	Kruskal-Wallis one way ANOVA	Freidman 2 way ANOVA	1.Spearman 2.Kendal rank 3.Kendal Coe
Continuous	1.Student's t-test 2.Mann-Whitney U	Paired t-test	1-way ANOVA	2-way ANOVA	Pearson's Correlation

Statistical Analysis

- "Proportions of patients in the two groups were compared with Fisher's exact test. Two-tailed P values of less than 0.05 were considered to indicate statistical significance. Parametric and nonparametric values were tested with Student's t-test and the Mann–Whitney U test, respectively."

NEJM 2002;347(20):1549-56.

Main Results

Outcome	Dexamethasone	Placebo	RR (95% CI)	P-value
Unfavorable Outcome				
All patients	23/157	36/144		
S. pneumoniae	15/58	26/50		
N. meningitidis	4/5	5/47		
Other bacteria	2/12	1/17		
Death				
All patients	11/157	21/144		
S. pneumoniae	8/58	11/50		
N. meningitidis	2/50	1/47		
Other bacteria	1/12	1/17		

NEJM 2002;347(20):1549-56.

HIGH-YIELD MED REVIEWS

Chi-squared vs. Fisher's exact

Variable	Chi-square test	Fisher's exact test
Sample Size	Large	Small
Desired Accuracy	Approximate	"Exact"
Considerations	▪ Becomes more accurate with larger sample sizes	▪ More exact regardless of number but harder to calculate by hand using computer. ▪ Note: is it really "exact"? ▪ Typically used when > 20% of the cells have a frequency of < 5 because an approximation at this level is inadequate.

HIGH-YIELD MED REVIEWS

Main Results

Outcome	Dexamethasone	Placebo	RR (95% CI)	P-value
Unfavorable Outcome				
All patients	23/157	36/144		
S. pneumoniae	15/58	26/50		
N. meningitidis	4/5	5/47		
Other bacteria	2/12	1/17		
Death				
All patients	11/157	21/144		
S. pneumoniae	8/58	11/50		
N. meningitidis	2/50	1/47		
Other bacteria	1/12	1/17		

NEJM 2002;347(20):1549-56.

HIGH-YIELD MED REVIEWS

Relative Risk

- RR = $\frac{\text{incidence rate in exposed patients}}{\text{incidence rate in non-exposed patients}}$

- RR = 1 (incidence is the same for both groups)
- RR = >1 (incidence in exposed group is higher)
- RR = <1 (incidence in exposed group is less)

HIGH-YIELD MED REVIEWS

Main Results

Outcome	Dexamethasone	Placebo	RR (95% CI)	P-value
Unfavorable Outcome				
All patients	23/157	36/144	< 1	
S. pneumoniae	15/58	26/50	< 1	
N. meningitidis	4/5	5/47	< 1	
Other bacteria	2/12	1/17	> 1	
Death				
All patients	11/157	21/144	< 1	
S. pneumoniae	8/58	11/50	< 1	
N. meningitidis	2/50	1/47	> 1	
Other bacteria	1/12	1/17	> 1	

NEJM 2002;347(20):1549-56.

HIGH-YIELD MED REVIEWS

Main Results

RR = $\frac{\text{incidence rate in exposed patients}}{\text{incidence rate in non-exposed patients}}$

1. Calculate the incidence in each group

HIGH-YIELD MED REVIEWS

Main Results

Outcome	Dexamethasone	Placebo	RR (95% CI)	P-value
Unfavorable Outcome				
All patients	23/157	36/144		
S. pneumoniae	15/58 _____	26/50 _____		
N. meningitidis	4/5	5/47		
Other bacteria	2/12	1/17		
Death				
All patients	11/157	21/144		
S. pneumoniae	8/58	11/50		
N. meningitidis	2/50	1/47		
Other bacteria	1/12	1/17		

NEJM 2002;347(20):1549-56.

HIGH-YIELD MED REVIEWS

Main Results

RR = $\frac{\text{incidence rate in exposed patients}}{\text{incidence rate in non-exposed patients}}$

1. Calculate the incidence in each group
2. RR = _____ / _____ = 0.5

HIGH-YIELD MED REVIEWS

Main Results

Outcome	Dexamethasone	Placebo	RR (95% CI)	P-value
Unfavorable Outcome				
All patients	23/157	36/144		
S. pneumoniae	15/58	26/50	0.50 (0.30 – 0.83)	
N. meningitidis	4/5	5/47		
Other bacteria	2/12	1/17		
Death				
All patients	11/157	21/144		
S. pneumoniae	8/58	11/50		
N. meningitidis	2/50	1/47		
Other bacteria	1/12	1/17		

NEJM 2002;347(20):1549-56.

HIGH-YIELD MED REVIEWS

Main Results

Outcome	Dexamethasone	Placebo	RR (95% CI)	P-value
Unfavorable Outcome				
All patients	23/157	36/144	0.59 (0.37 – 0.94)	
S. pneumoniae	15/58	26/50	0.50 (0.30 – 0.83)	
N. meningitidis	4/5	5/47	0.75 (0.21 – 2.63)	
Other bacteria	2/12	1/17	2.83 (0.29 – 27.8)	
Death				
All patients	11/157	21/144	0.48 (0.24 – 0.96)	
S. pneumoniae	8/58	11/50	0.41 (0.19 – 0.86)	
N. meningitidis	2/50	1/47	1.88 (0.76 – 20.1)	
Other bacteria	1/12	1/17	1.42 (0.10 – 20.5)	

Which results are significant?

NEJM 2002;347(20):1549-56.

HIGH-YIELD MED REVIEWS

High-Yield
APPLICATION

How can we look at this another way?

NNT

$$RR = \frac{\text{incidence rate in exposed patients}}{\text{incidence rate in non-exposed patients}}$$

1. Calculate the incidence in each group
2. RR = 0.26 / 0.52 = 0.5
3. ARR = _____ – _____ = _____
4. NNT = 1/ _____
   = _____
   - You would have to treat about ____ patients with dexamethasone 10 mg IV x 6 hrs x 4 days with *S. pneumonia* meningitis for 1 patient to have a favorable outcome.
   - Versus …… 10 patients if considering "all patients"

HIGH-YIELD MED REVIEWS

The Results in the Context of Evidence

- Cochrane Review
  - 25 RCTs (n = 4121; with 2511 children, 1517 adults, 93 mixed):
    - Quality of RCTs: 4 were high, 14 were medium; 7 were low
  - Results:
    - Non-significant reduction in mortality (regardless of age);
      - 17.8% vs. 19.9%, RR 0.9, 95% CI 0.8 – 1.01
    - Lower rates of severe hearing loss
      - RR 0.67, 95% CI, 0.51 – 0.88
    - Lower rates of neurologic complications
      - RR 0.83, 95% CI 0.69 – 1.00 **
    - Sub-group analysis only showed reduction in mortality if organism was Streptococcus pneumonia
      - Not H. influenza or N. meningitidis

Cochrane Database Syst Rev 2015; Sep 12(9):CD004405.

Agenda

- A General Overview
- Part 1 – Conquering the Biostatistics Question
- Part 2 – Interpreting Statistical Results Correctly
- A Special Coupon Code
- Live Q&A

HIGH-YIELD MED REVIEWS

Coupon

- Limited time coupon
  - Coupon = **BPSSAVE10**
    - *10% OFF ENTIRE ORDER*
  - Expires = **Sept 30, 2022**

Live Q&A

HIGH-YIELD
MED REVIEWS

HIGH-YIELD
MED REVIEWS

HIGH-YIELD
MED REVIEWS

Why Should I Consider High-Yield Med Reviews? …

What makes you different?

HIGH-YIELD
MED REVIEWS

High Yield Study Tools

Lectures & Books
- 225+ Core topics available
- Organized by topic areas
- HD lectures for quality
- Works on all devices
- Monitors your progress

Q-Bank
- 2,000+ practice questions
- Select topic categories
- Teaching points provided
- Performance statistics
- Ability to flag questions
- Peer comparison metrics

Case Reviews CE
- Available on-demand
- Integrates content
- Builds on knowledge
- Facilitates application
- Taught by expert faculty

Biostatistics CE
- EBM
- Biostatistics
- Literature Evaluation and Application

Rapid Review
- Review core concepts quickly.
- Final step in comprehensive review

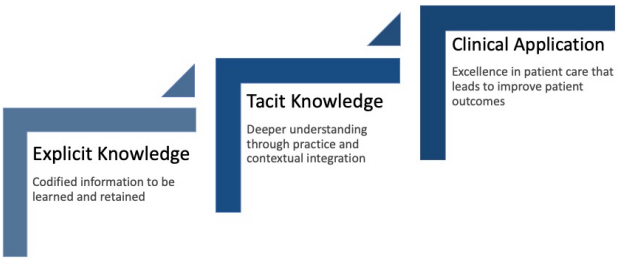
Other Study Tools
- Landmark Clinical Trials Reviews
- Live Study Groups with Open Q&A

How does all of that fit together?

HIGH-YIELD
MED REVIEWS

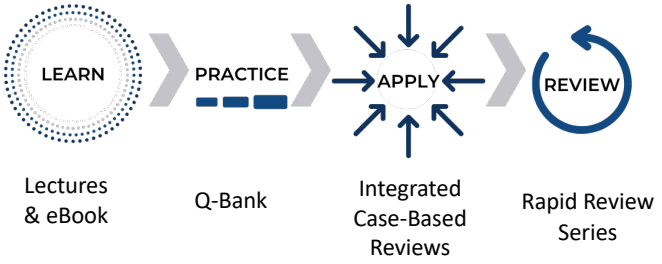
Knowledge Transfer

The High-Yield Approach

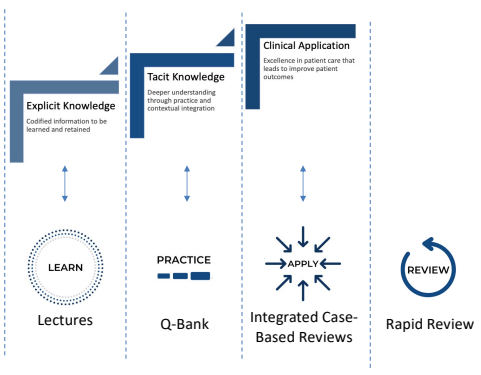


Knowledge Transfer

The High-Yield Approach



The High-Yield Approach



The High-Yield Approach