Research and Evidence-Based Medicine Committee: 2010-11

Evidenced-Based Medicine: Where Does it Fit in Foot and Ankle Surgery?

MODULE: *Choosing the Appropriate Statistical Analysis Tool*

American College of
Foot and Ankle Surgeons

Research and Evidence-Based
Medicine Committee: 2007-08

ACFAS.org
FootPhysicians.com

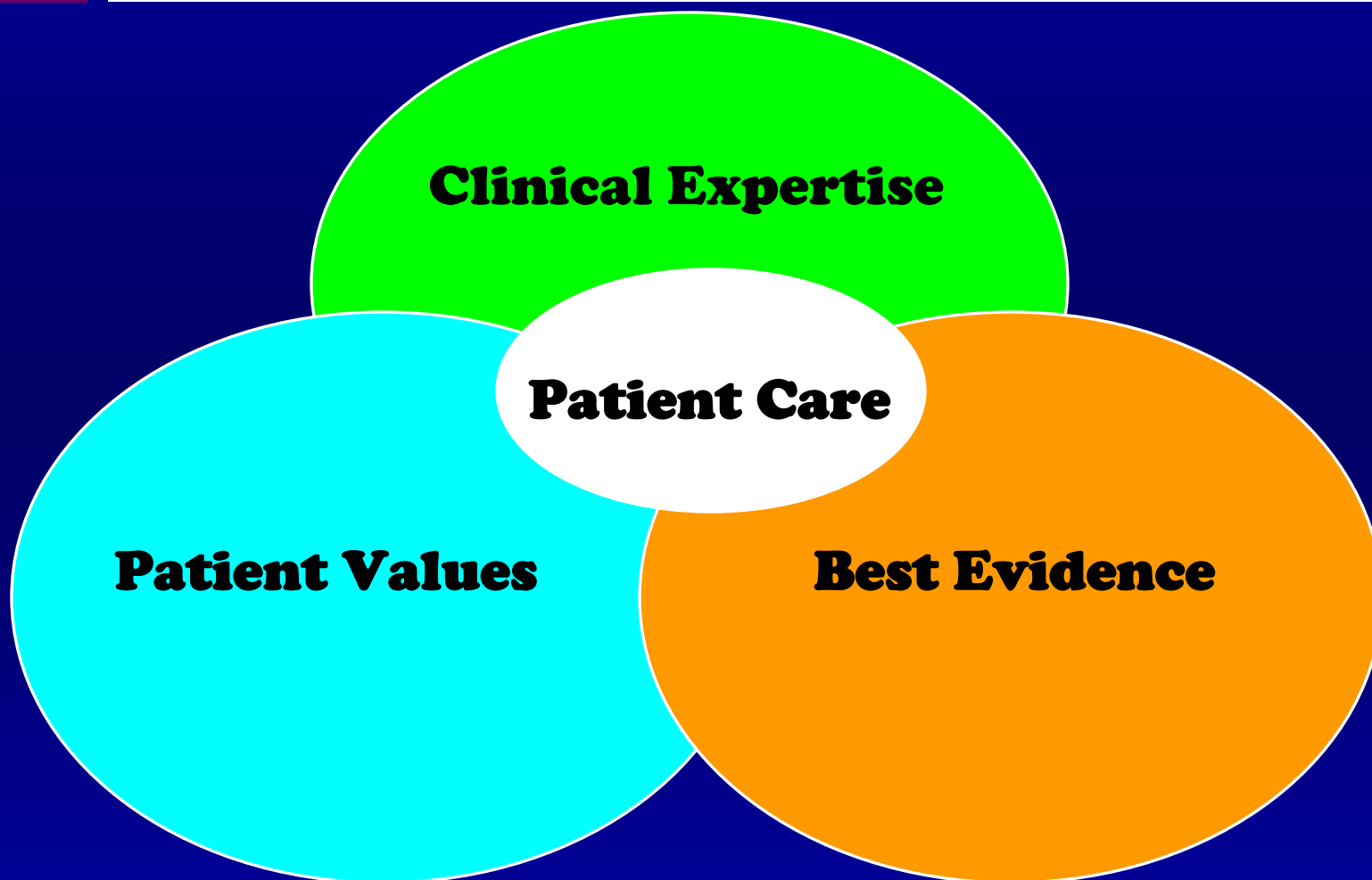# *Evidence-Based Medicine*

✓ **The conscientious, explicit, and judicious use of current best evidence in making decisions about the care of the individual patient**

✓ **It means integrating individual clinical expertise with the best available external clinical evidence from systematic research**

Dr. David Sackett, 1996

Fundamental Principles

- ✓ **Evidence is never enough**
- ✓ **Hierarchy within EBM**

American College of
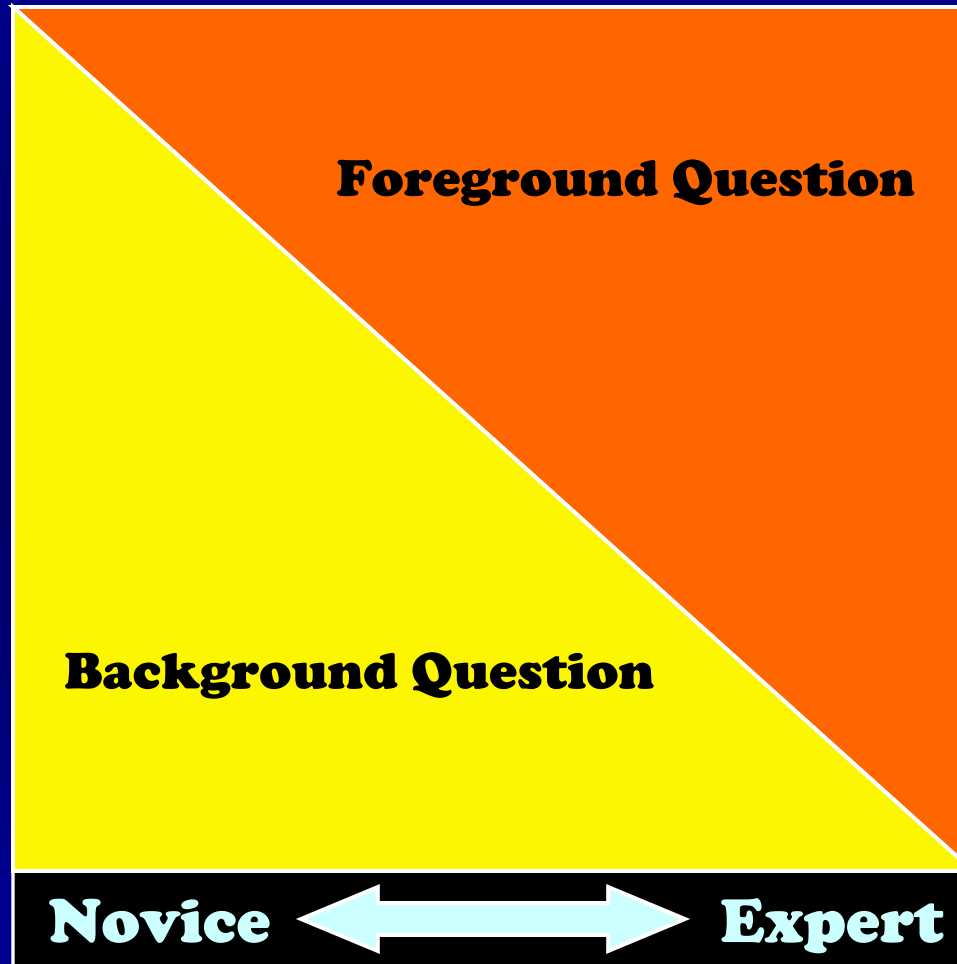Foot and Ankle Surgeons

Research and Evidence-Based
Medicine Committee: 2007

ACFAS.org
FootPhysicians.com

Steps In EBM Process

✓ **Clinical Problem**

✓ **Question**

✓ **Resource**

✓ **Evaluation**

✓ **Patient**

American College of
Foot and Ankle Surgeons

Research and Evidence-Based
Medicine Committee: 2007

ACFAS.org
FootPhysicians.com

Asking the Question

Foreground Question

Background Question

Novice ← → Expert

American College of
Foot and Ankle Surgeons

Research and Evidence-Based
Medicine Committee: 2007

ACFAS.org
FootPhysicians.com

Hierarchy of EBM

Meta-Analysis

Systematic Review

Randomized Controlled Trial

Cohort Studies

Case Control Studies

Case Series/Case Reports

Animal Research/Laboratory Studies

American College of
Foot and Ankle Surgeons

Research and Evidence-Based
Medicine Committee: 2007

ACFAS.org
FootPhysicians.com

"P.I.C.O."

✓ **Patient + Problem**

✓ **Intervention**

✓ **Comparison**

✓ **Outcome**

American College of
Foot and Ankle Surgeons

Research and Evidence-Based
Medicine Committee: 2007

ACFAS.org
FootPhysicians.com

Levels of Evidence

✓ **January 2003**
- **Journal of Bone and Joint Surgery American**

✓ **February 2005**
- **American Academy of Orthopaedic Surgeons**

JBJS Am Levels of Evidence

✓ **I, II, III, IV, V based on design**

✓ **Types**

- **Therapeutic**
- **Prognostic**
- **Economic**
- **Decision Analysis**

JBJS Am: *Levels of Evidence*

✓ **Randomized Control Trial**
- **Level I or II**

✓ **Cohort**
- **Level II or III**

✓ **Case Control**
- **Level III**

✓ **Case Series**
- **Level IV**

✓ **Expert Opinions**
- **Level V**

American College of
Foot and Ankle Surgeons

Research and Evidence-Based
Medicine Committee: 2007

ACFAS.org
FootPhysicians.com

Levels of Evidence in Orthopaedic Journals

- ✓ *Journal of Bone and Joint Surgery Am + Br*
- ✓ *Journal of Orthopaedic Trauma*
- ✓ *Journal of Shoulder and Elbow Surgery*
- ✓ *American Journal of Sports Medicine*
- ✓ *Journal of Prosthetics and Orthotics*
- ✓ *Foot and Ankle International*
- ✓ *Journal Hand Surgery*
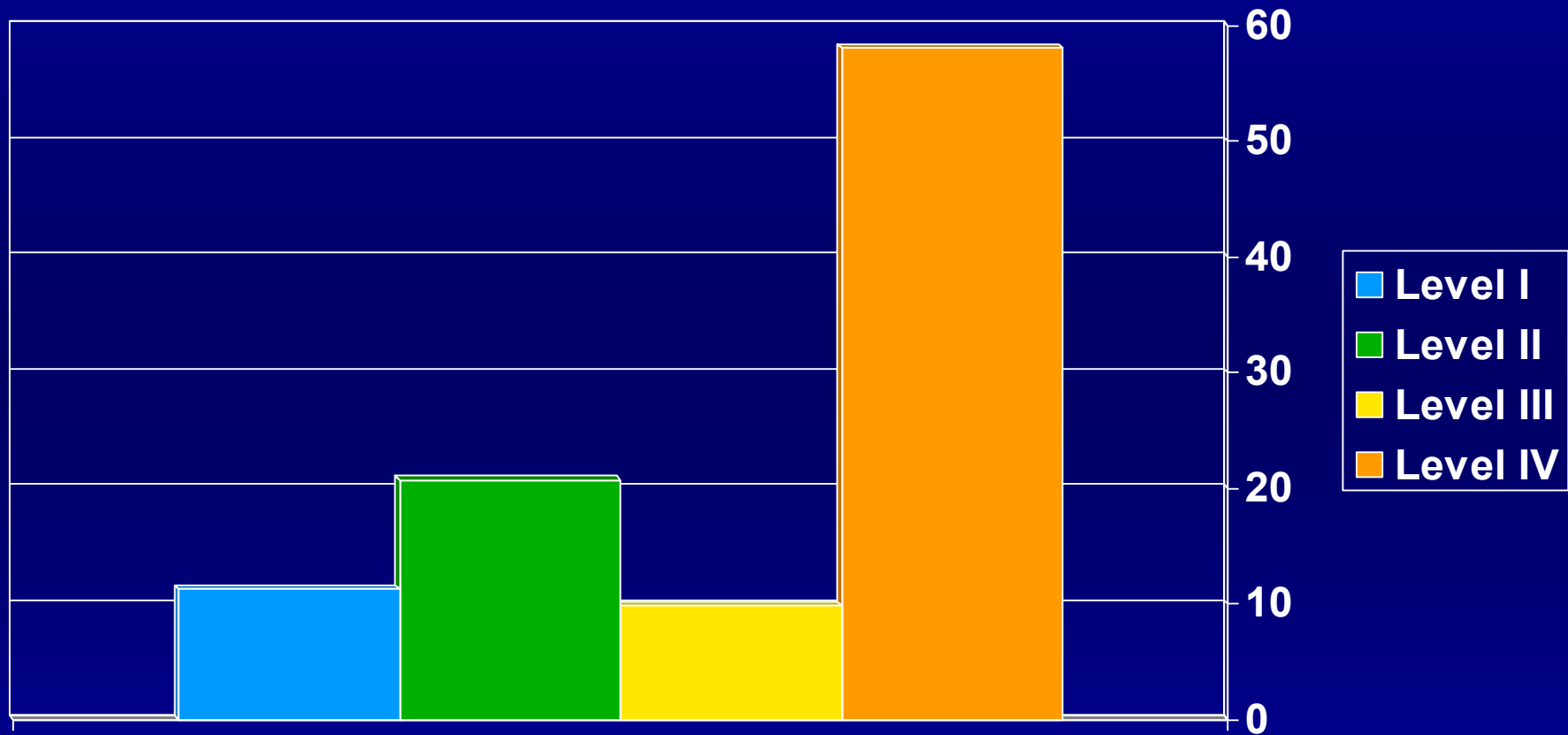- ✓ *Journal of Athroplasty*

JBJS 87A(12), 2005

Levels of Evidence

Legend:
- Am J Sports Med
- FAI
- J Arthroplasty
- JBJS Am
- JBJS Br
- J Hand Surg
- JOT
- JPO
- J Shoulder/Elbow

Categories: Level I, Level II, Level III, Level IV
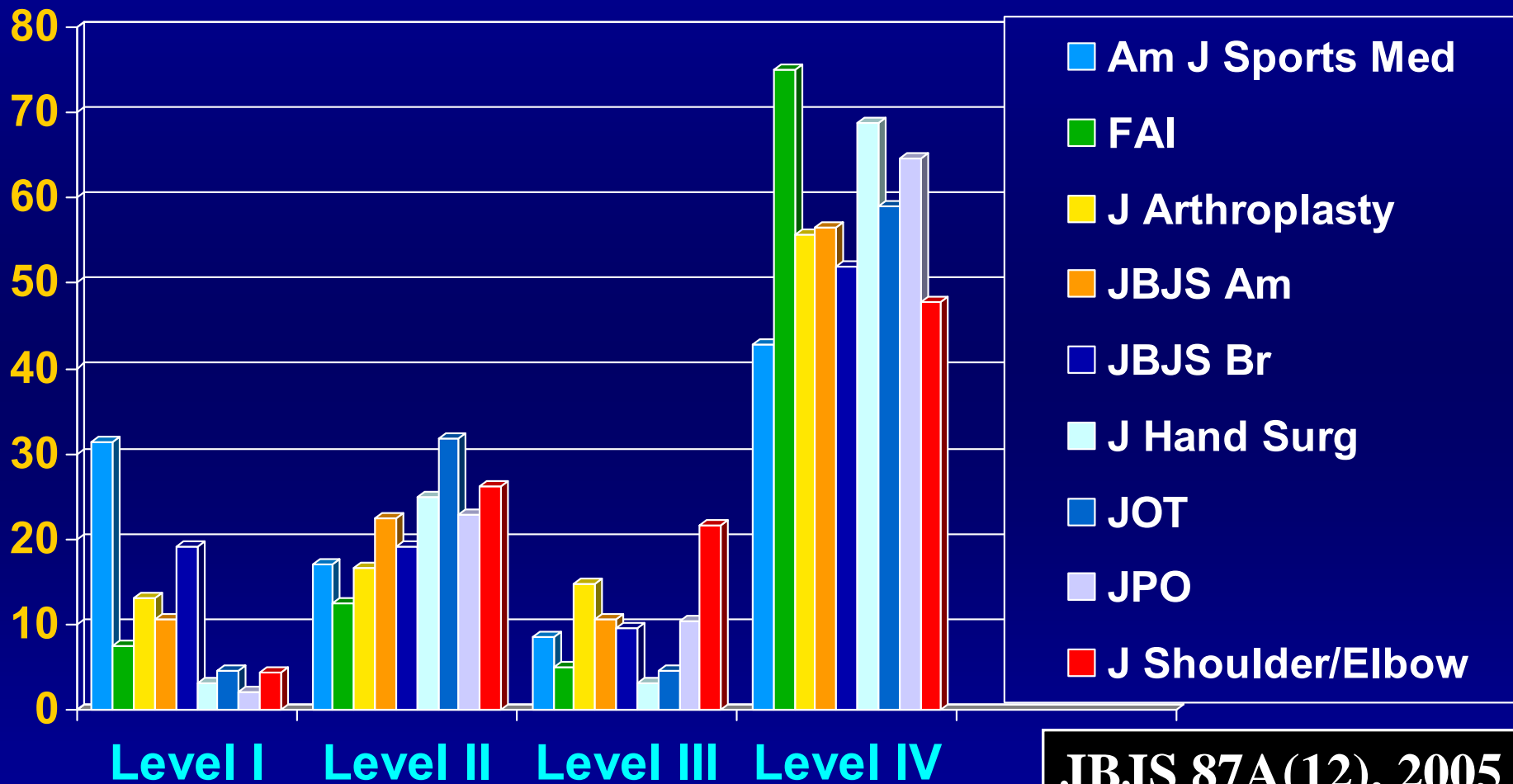
JBJS 87A(12), 2005

Levels of Evidence

JBJS 87A(12), 2005

American College of
Foot and Ankle Surgeons

Research and Evidence-Based
Medicine Committee: 2007

ACFAS.org
FootPhysicians.com

Evaluation of the Foot and Ankle Literature

- ✓ *Journal Foot and Ankle Surgery*
- ✓ *Foot and Ankle International*

American College of
Foot and Ankle Surgeons

Research and Evidence-Based
Medicine Committee: 2007

ACFAS.org
FootPhysicians.com

✓ **Jan/Feb 2005 – Nov/Dec 2010**

- **593 Articles**
- **19 Level I**

September/October 2006
Volume 45, Number 5

The Journal of Foot & Ankle Surgery

Official Publication of the
American College of
Foot and Ankle Surgeons

W. B. Saunders

American College of
Foot and Ankle Surgeons

Research and Evidence-Based
Medicine Committee: 2007

ACFAS.org
FootPhysicians.com

"Target your reading to particular issues related to the patient"

American College of
Foot and Ankle Surgeons

Research and Evidence-Based
Medicine Committee: 2007

ACFAS.org
FootPhysicians.com

EBM Literature Sources

- ✓ **Cochrane Database**
- ✓ **Medline**
- ✓ **UpToDate**
- ✓ **Best Evidence**
- ✓ **OVID**

American College of
Foot and Ankle Surgeons

Research and Evidence-Based
Medicine Committee: 2007

ACFAS.org
FootPhysicians.com

AGAINST ⬄ *FOR*

AGAINST	FOR
✓ **"Old Hat"**	✓ **Strong Evidence**
✓ **Cook Book Medicine**	✓ **One Part**
✓ **Population Studies**	✓ **Patient Decision**
✓ **Lack of Gold Standard**	✓ **Evidence Pyramid**
✓ **Access Difficulty**	✓ **Trained Professionals**

- ✓ **There are 3 steps in deciding which appropriate statistical tool should be used to evaluate for significance for a given data set.**

- ✓ **Follow the pathway that leads you down the appropriate pathway by following the "pathway slide" numbers at the top left of the slide.**

- ✓ **Each pathway slide will be followed by a slide that provides definitions.**

✓ **Continuous:** *when the values/observations belonging to it can take on any value within a finite or infinite interval*

- **Example: height; weight; temperature; time**

✓ **Discrete:** *when the values/observations are distinct and separate (they can be counted)*

- **Example: number of patients; blood group**

DEFINITIONS: *What type of data is it?*

✓ **Categorical:** *when the values/observations belonging to it can be sorted according to category*
- **Example: male/female**

✓ **Nominal:** *when the values/observations belonging to it can be assigned a code in the form of a number, where the numbers are simply labels*
- **Example: male coded as 1, female coded as 2**

✓ **Ordinal:** *when the values/observations belonging to it can be ranked (put in order)*
- **Example: 0-10 pain scale (0=no pain; 10=worst possible pain)**

American College of
Foot and Ankle Surgeons

Research and Evidence-Based
Medicine Committee: 2007-08

ACFAS.org
FootPhysicians.com

DEFINITIONS

✓ **Normally Distributed:** *a frequency distribution defined by a particular mathematical function; a normal random variable*

- Example: height at a given age, gender, race

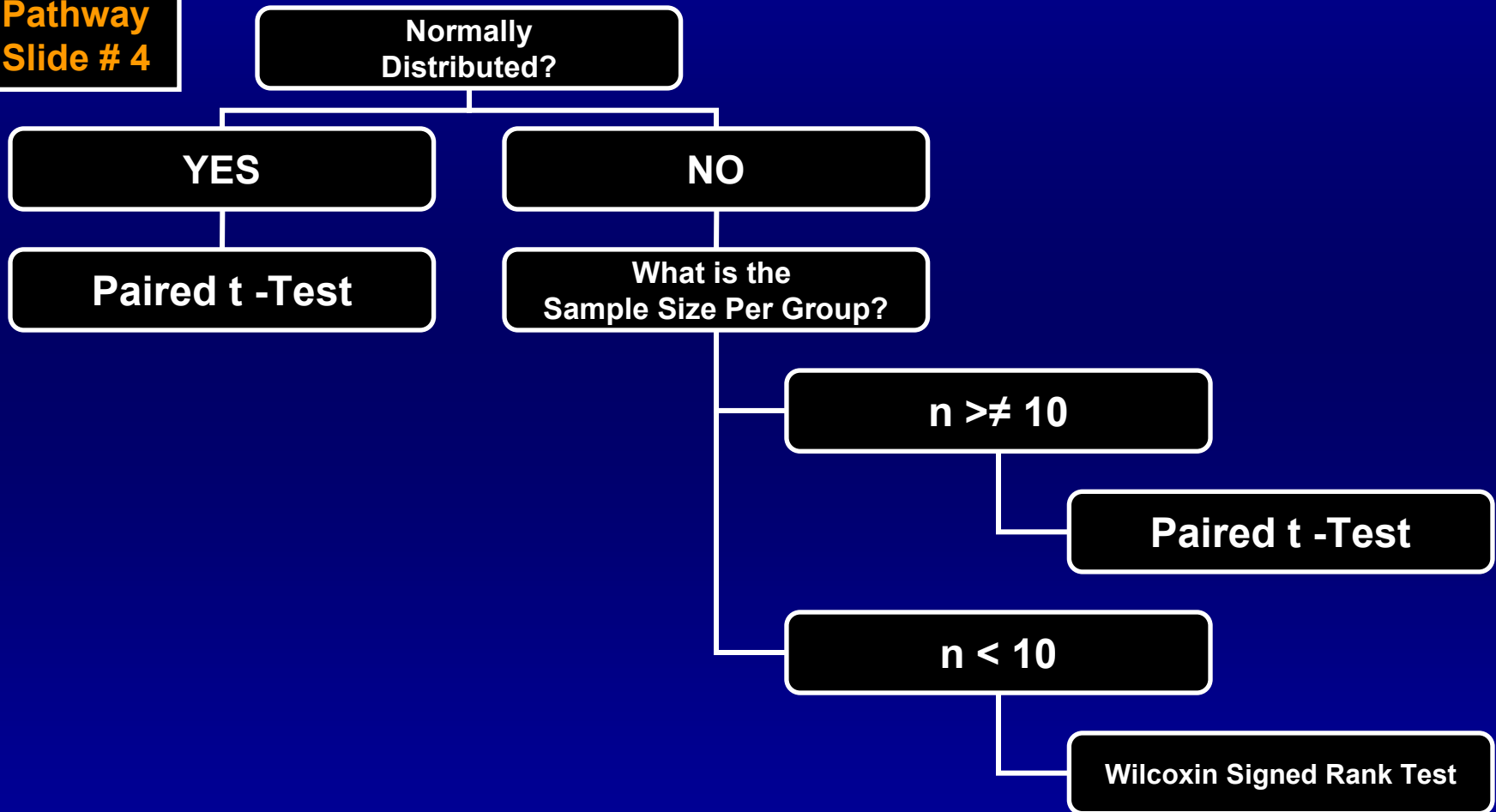✓ **t-Test:** *a statistical inference used to determine the probability of something occurring by chance*

American College of
Foot and Ankle Surgeons

Research and Evidence-Based
Medicine Committee: 2007-08

ACFAS.org
FootPhysicians.com

DEFINITIONS

- **Paired t-Test:** *used to determine whether there is a significant difference between the average values of the same measurement made under two different conditions*

- **Wilcoxin Signed Rank Test:** *designed to test a hypothesis about the median of a population distribution; e.g. before and after data (does not require the assumption that the population is normally distributed)*
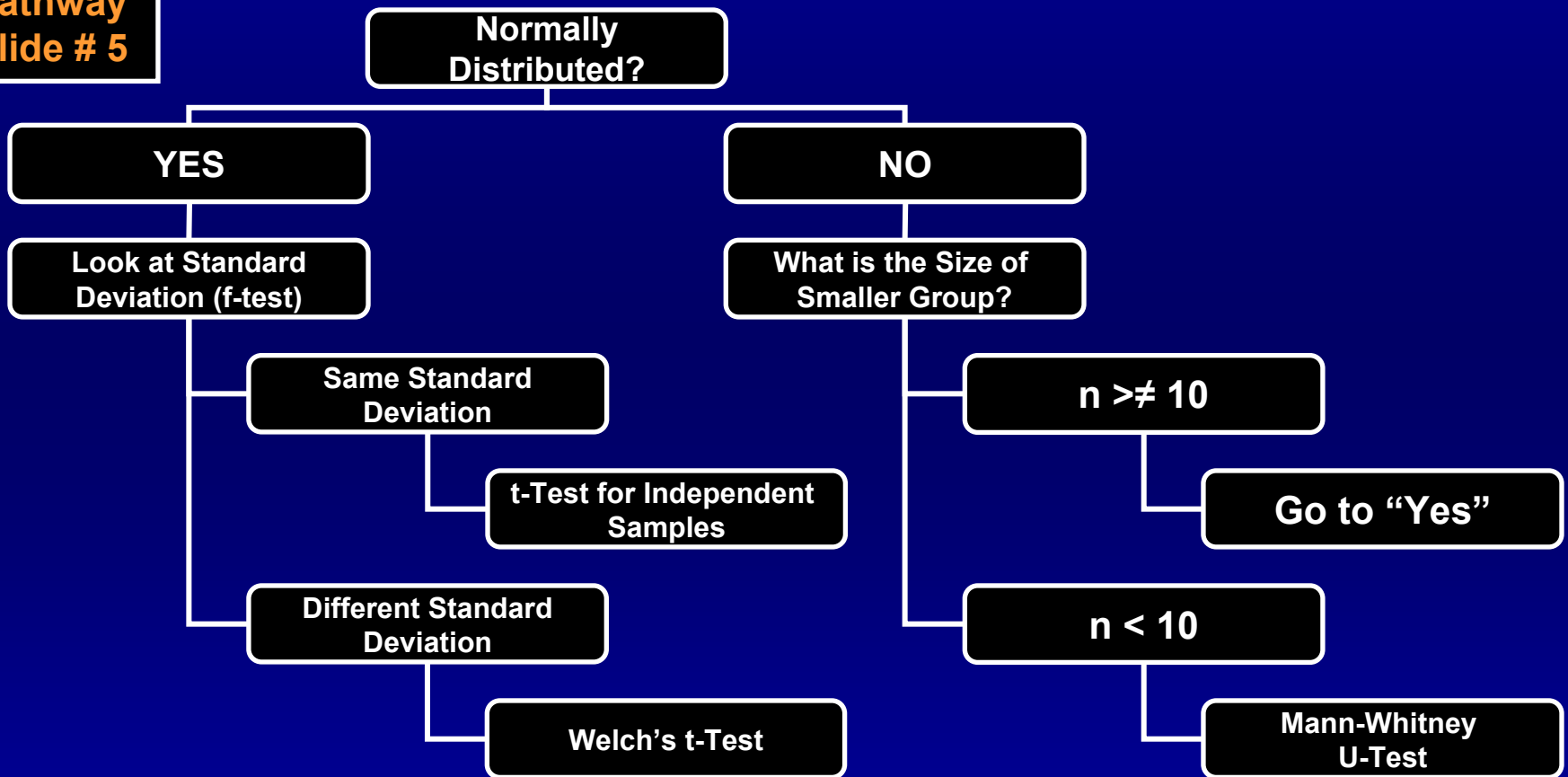
DEFINITIONS

- ✓ **Standard Deviations:** *measure of the spread or dispersion of the data*
- ✓ **T-Test for Independent Samples:** *used to compare two small sets of quantitative data when samples are collected independently of one another*
- ✓ **Welch's Test (similar to the t-test):** *tests two samples with unequal variances*

American College of
Foot and Ankle Surgeons

Research and Evidence-Based
Medicine Committee: 2007-08

ACFAS.org
FootPhysicians.com

DEFINITIONS

- ✓ **Mann-Whitney U-Test:** *compares two unpaired groups; looks at relative ranks of subjects in the two groups*

- ✓ **F-Test:** *compares standard deviations*

American College of
Foot and Ankle Surgeons

Research and Evidence-Based
Medicine Committee: 2007-08

ACFAS.org
FootPhysicians.com

DEFINITIONS

- ✓ **One Sample Binomial Test:** *when there are two possible outcomes*

- ✓ **McNemar Test:** *tests the difference between paired proportions; same subjects before and after measurements*

- ✓ **Chi-Square Test:** *comparison of two attributes in a sample of data/population to determine if there is any relationship between them*

- ✓ **Fischer's Exact Test:** *used to determine if there are nonrandom associations between two categorical variables; used when expected frequencies are small*
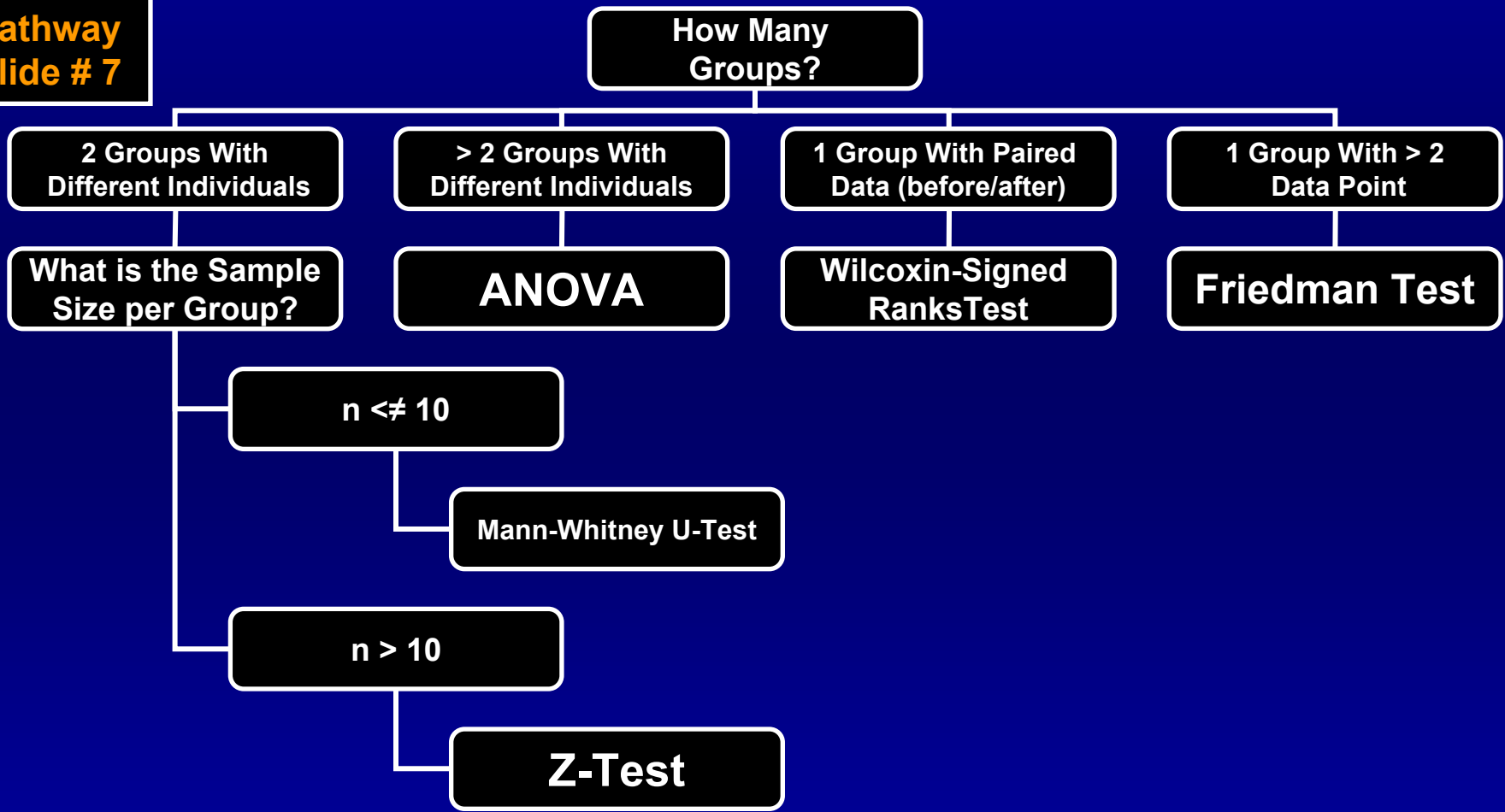
DEFINITIONS

- **Mann-Whitney U-Test:** *compares two unpaired groups; looks at relative ranks of subjects in the two groups*

- **Z-Test:** *used to compare the mean of a sample with the population mean when the standard deviation is known*

- **ANOVA (Analysis of Variance):** *a statistical inference to test differences between 3 or more groups or repeated times for a single group*

American College of
Foot and Ankle Surgeons

Research and Evidence-Based
Medicine Committee: 2007-08

ACFAS.org
FootPhysicians.com

DEFINITIONS

- ✓ **Wilcoxin Signed Rank Test:** *designed to test a hypothesis about the median of a population distribution; e.g. before and after data (does not require the assumption that the population is normally distributed)*

- ✓ **Friedman Test:** *used to detect differences across multiple test attempts*

American College of
Foot and Ankle Surgeons

Research and Evidence-Based
Medicine Committee: 2007-08

ACFAS.org
FootPhysicians.com

CONCLUSIONS

- ✓ **After following this pathway you can be confident that you are using the appropriate statistical tool to establish significance of your data**

- ✓ **Utilize a computer statistical package to conduct the actual statistical analysis**

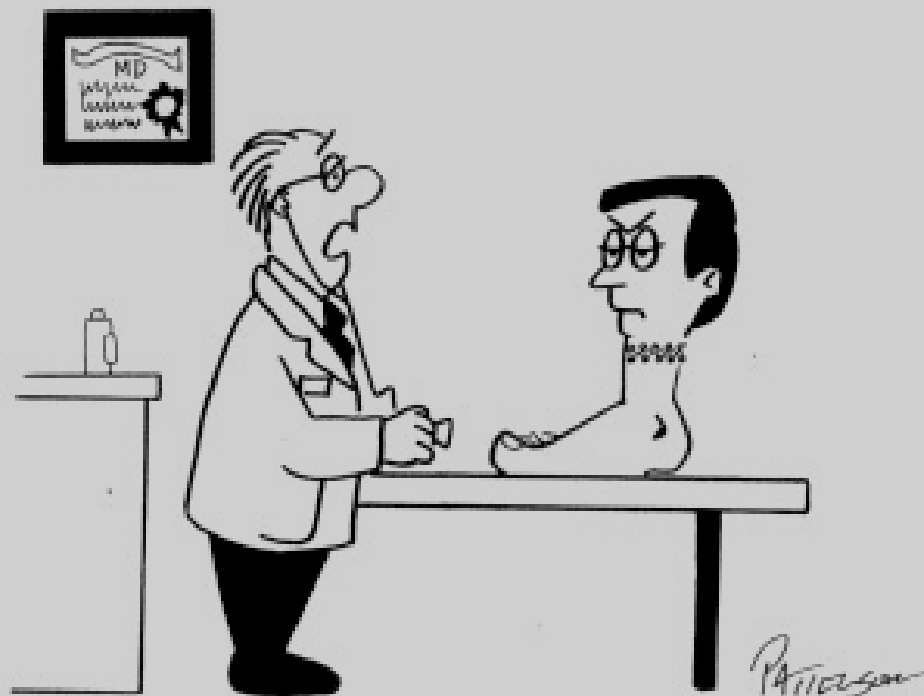- ✓ **It is a good idea to get a statistician involved in the process**

Where Does EBM Fit with Foot and Ankle Surgery??

American College of
Foot and Ankle Surgeons

Research and Evidence-Based
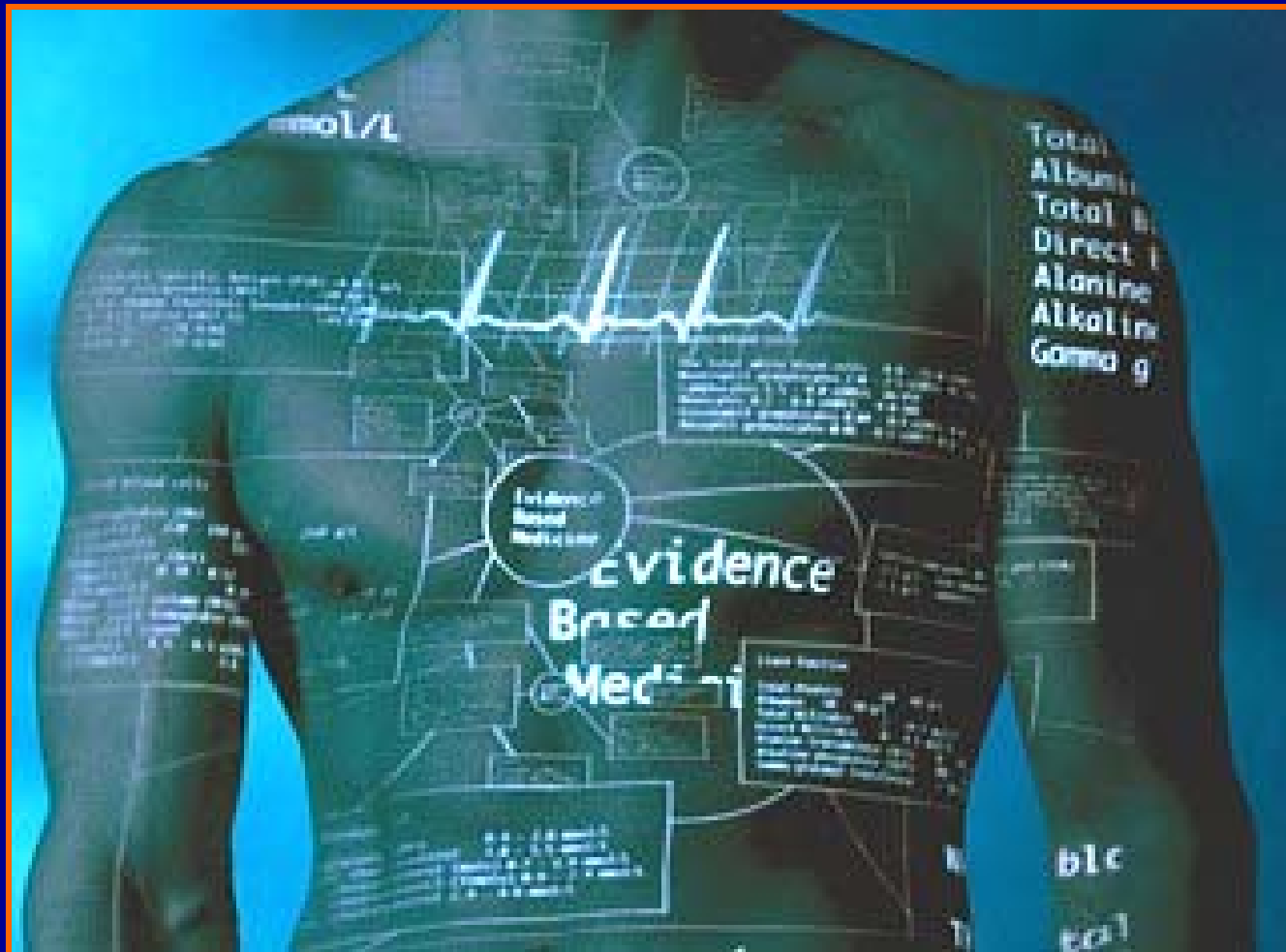Medicine Committee: 2007-08

ACFAS.org
FootPhysicians.com

Where Does EBM Fit ?

- ✓ **ACFAS**
- ✓ **Research**
- ✓ **EBM ONLY??**
- ✓ **Your Step**

"The surgery went well - we were able to save the foot after all."

American College of
Foot and Ankle Surgeons

Research and Evidence-Based
Medicine Committee: 2007-08

ACFAS.org
FootPhysicians.com

THANK YOU !