Ideas to Execution and Dissemination: Nuts and Bolts of Research and EBP Projects

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• “Howdy” and jokes in a talk about research and EBP…what gives?
• Methods to Enhance the Retention of Information (Brown, Hansen-Brown & Conte, 2011; National Training Laboratories, 2013)
Learning Goals

• Developing Evidence-Based Interventions and the Research Process
• Cautions in Interpreting Evidence
• Building Research Teams
• Disseminating Findings
  – Posters
  – Verbal Presentations
Example: Heart Disease & Depression

• Staff Meeting
• Problem:
  – Patients admitted for heart disease also demonstrate high rates of depression
  – High rate of recidivism for both conditions has been identified
• Goal or Charge:
  – Build an educational intervention to promote exercise adherence, improve outcomes, assess and disseminate results
• Where do you start?
• Gathering Evidence:
  – Literature, experts, guidelines
Literature Review: What are the Physiological Benefits of Exercise?

- **Reduces:**
  - Risk of heart disease and stroke
  - High blood pressure
  - Noninsulin-dependent diabetes risk
  - Body fat (facilitates prevention of obesity)
  - Risk of osteoporosis

- **Facilitates**
  - Immune system functioning
  - Musculoskeletal health
  - Oxidative enzymes production
  - Glycogen storage
  - Myoglobin volume
Literature Review: What are the Psychological Benefits of Exercise?

- Reduces negative affect
  - Anxiolytic effect
  - Reduces depression
- Facilitates social interaction and development of interpersonal relationships
- Improves positive affect
  - Self-efficacy
  - Vigor
  - Well-being
- Exercise and psychotherapy
Literature Review: Environmental Factors and Exercise Psychology Outcomes

• Q: Do you prefer to exercise alone or with others?

• Q: Do you prefer to exercise outside or indoors?

• Exercising in a socially enriched environment results in greater self-revitalization and self-efficacy compared to a socially bland environment

• Social psychology examples
  – Casino, Disney and Sports
Literature Review: Factors Influencing Psychological Benefits of Exercise

- Q: How many of you exercise while listening to music?
- Q: Why do you listen to music while exercising?
- Research suggests that listening to music during exercise can improve positive affect.
- Music is also thought to improve exercise performance by:
  - Reducing the perception of fatigue
  - Increasing physiological arousal
  - Encouraging motor coordination
  - Increasing relaxation
- Examples
  Personalization (patient preference)
Interpreting Evidence: Cautions and Shortcomings

- Limitations of Interpretation
  - Context/Populations (personalized interventions)
    - Paradigm and Funding Agencies
  - Meta-Analytics & Meta-Syntheses
  - Role of Academic Journals

- Misuses of Evidence
“Statistics don’t lie, people do.”
Misleading Pictures
Misleading Scales

Poll Results

- Republican
- Democrat
- Other
Misleading use of Central Tendency

- Home values
  - $200,000
  - $220,000
  - $230,000
  - $250,000
  - $275,000
  - $280,000
  - $650,000

- Mean = $300,714
- Median = $250,000
Misleading Relationships

• **Spurious links**
  – Cappuccino makers in homes linked to healthier babies
  – Ice cream consumption is associated with drowning

• **Correlation vs Causation**
  – MMR vaccinations cause autism
Inadequate Information

• The program experienced a 300% growth rate from the previous year!
Building an Intervention

• Feasibility (access, cost, time, etc.…)
• Build the intervention
  – What components would you want to include in your intervention?
    • Benefits of exercise
    • Contextual factors (social, environment, etc.…)

Developing Research Questions

- Are 10-week outdoor or indoor exercise interventions more effective in reducing recidivism and negative psychological affect in patients admitted for heart disease?

- Is an 8-week music-based exercise intervention effective in promoting exercise adherence and reducing depression compared to a control condition for patients diagnosed with heart disease and depression?

- Is group exercise more effective in fostering exercise self-efficacy compared to individual exercise?

- What linear combination of factors predicts exercise adherence?
Research Teams and Collaboration

The Research Team and Evaluation of Skillsets

Considerations:
- Methodology
- Data
- Instrumentation
- Sampling

Are you a Nurse and a Statistician?

Diagram of the Causes of Mortality in the Army in the East

The black line across November 1854 marks the boundary of the deaths from all other causes during that month. In October 1854, the black coincides with the red.
Research Teams

• Frequently Asked Consulting Questions
  – I want to do a “quantitative study”
  – What sample size do I need to conduct this investigation?
  – I gathered data on_______over the last three months. Now I’m done. Can you help me analyze it?
Research Teams

Methodological Consulting Best-Practices

- Involve a statistician/methodologist early
  - Population, sample, power analysis
  - Instrumentation
  - Link between research question and approach
  - Codebook/data formatting
- Be prepared with potential research questions
- Clearly define expectations and deadlines
- When all else fails, use bribes!
Populations and Samples

- What are some of the challenges in studying populations?
  - The population of interest could be very large (for example, all teenagers in the United States)
  - Access to the population of interest could be time consuming, costly, or not possible because of demographic limitations
- As such, researchers study subsets of the population, also called *samples*
Populations and Samples

• Returning to our example, the researcher is interested in the effects of an exercise intervention on depression and recidivism for patients with heart disease.

• Rather than studying all people with heart disease (the population), the researcher selects a more manageable number to study (the sample).

• The figure demonstrates the process of selecting a sample from a population (the numbers used are examples only).
α = .05

How do we know our intervention was effective?
Inferential Statistics, Probability, and the Alpha Coefficient

- Inferential statistics use samples and probability to make inferences about a population
- Checker selection inference:
  - This box of checkers contains 20 pieces (10 red and 10 black)

\[
\frac{1}{2} = 50\% \\
\frac{1}{4} = 25\% \\
\frac{1}{8} = 12.5\% \\
\frac{1}{16} = 6.25\% \\
\frac{1}{32} = 3.125\% \\
\frac{1}{64} = 1.5625\%
\]
Hey Girl,
You had me at .05
Using a Sample to Test Hypothesis about a Population Mean

\[ M = 45 \text{ (from } H_0) \]

Reject \( H_0 \)

\[ Z = 2.0 \]

\[ z = -1.96 \]

\[ \mu = 45 \text{ (from } H_0) \]

\[ z = +1.96 \]
Effect Sizes: How Well Did the Treatment Work?

- Statistical vs Practical Significance
- Effect Size

Cohen’s d = \( \frac{M - \mu}{\sigma} = \frac{47 - 45}{5} = 0.40 \)

- What does this mean?
Interpreting Effect Size

- Effect sizes are generally defined as:
  - small \((d = .2)\)
  - medium \((d = .5)\)
  - large \((d = .8)\)

- Effect size calculation varies depending on whether you plan to use ANOVA, t test, regression or correlation. Cohen’s effect size measures are well known in research and can be classified as small, medium or large.

- \(t(24) = 2.0, p < 0.05, d = 0.40\)
Visualizing Effect Sizes – P90X
Dissemination: Posters and Presentations

• Design
  – Leave adequate white space
  – Make it readable
    • Contrast and font size
  – Use color sparingly
  – Clear message
    • Time: 3 – 5 minutes
    • Left to Right
  – Pictures are worth a thousand words!
EBP Poster Presentations

Source: Image © Photos.com
Utilizing Perioperative Services to Creatively Solve Hospital Capacity Constraints
Betty Sue Minton, MSN, RN; Diane Johnson, MSN, RN
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BACKGROUND
- In 2012, there were approximately 35,112 adult surgeries performed at Vanderbilt University Medical Center (VUMC).
- Approximately 400 potential surgeries turned away annually.
- Local/regional referring physicians were frustrated by the difficulty of getting patients access to our tertiary care system.

Solution
Increase bed capacity for patients coming from outside referrals.
1) Improve access to surgical specialties.
2) Create a surgical transition unit (STU).

STU
6 pre-operative beds converted into inpatient beds.

OBJECTIVE
- Increase annual surgical volume.
- Optimize the use of perioperative space.

IMPLEMENTATION
- STU opened in March 2011.

STEP 1: STU was created using 6 pre-operative beds.
- Vision
- Staff buy-in

STEP 2: Hired acute care nurse practitioner to accept and manage patients.

STEP 3: Collaborative implementation team formed.
- Collaborative team:
  - Medical Director
  - Acute Care Nurse Practitioner
  - Staff
  - Ancillary services: Pharmacy, Linens, Nutrition, Guest Services
- Resources:
  - Supplies
  - Documentation / IT
- Action Items:
  - Medication requirements
  - Scope of service
  - Communication map
  - Acuity guidelines
  - Hours of operation

STEP 4: Open Surgical Transition Unit.

STEP 5: Evaluate.

EVALUATION
Successes
- Increase in referring surgical volume within the first 6 months.
- Within first 6 months, 25% of referrals become surgical cases.
- Reduced capacity constraints within the emergency department and inpatient areas.
- Doubled size of STU after first 6 months.

Challenges
- Decreased number of pre-operative beds.
- Inpatient area within a procedural area.
- Two separate documentation systems.
- Providing family-centered care.

BENEFITS of STU
- STU improved flexibility by working through a rapid cycle improvement process.
- Creation of STU expanded role of advanced practice nurses in perioperative services.
PIGS IN SPACE:
EFFECT OF ZERO GRAVITY AND
AD LIBUTUM FEEDING ON WEIGHT
GAIN IN CAVIA PORCELLUS

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ABSTRACT:
One ignored benefit of space travel is a potential elimination of obesity, a chronic problem for a growing majority in many parts of the world. In theory, what an individual is in a condition of zero gravity, weight is eliminated. Indeed, in space one could conceivably follow ad libitum feeding and never gain any weight, and the only side effect would be the need to upgrade one’s stretchy pants (exercise pants). But because many diet schemes start as very good theories only to be found to be rather harmful, we tested our predictions with a long-term experiment in a colony of Guinea pigs (Cavia porcellus) maintained on the International Space Station. Individuals were housed separately and given unlimited amounts of high-calorie food pellets. Fresh fruits and vegetables were not available in space so were not offered. Every 30 days, each Guinea pig was weighed. After 6 years, we found that individuals on average weighed nothing. In addition to weighing nothing, no weight appeared to be gained over the duration of the protocol. If space continues to be gravity-free, we believe that assumption is sound, we believe that sending the overweight — and those at risk for overweight — to space would be a lasting cure.

INTRODUCTION:
The current obesity epidemic started in the early 1990s with the invention and proliferation of elastics and related stretchy fibers, which released wearers from the rigid constraints of clothes and permitted monthly weight gain without the need to buy new outfits. Indeed, exercise today for hundreds of million people involve only the act of wearing stretchy pants in public, presumably because the constractive pressure forces fat molecules to adopt a more compact tertiery structure (Xavier 1995).

Luckily, at the same time that fabrics became stretchy the race to the moon between the United States and Russia yielded a useful fact: gravity in outer space is minimal to nonexistent. When gravity is zero, objects cease to have weight. Indeed, early astronauts and cosmonauts had to secure themselves to their ships with seat belts and sticky boots. The medical opposition to weight loss was noted in many cases, and space travel was prohibitively expensive and thus the issue was not seriously pursued. Now, however, multiple companies are developing cheap extra-terrestrial travel options for normal consumers, and potential travelers are also creating new ways to pay for products and services that they cannot actually afford. Together, these factors open the possibility that moving to space could cure overweight syndrome quickly and permanently for a large number of humans.

We studied this potential by following weight gain in Guinea pigs, known on Earth as fond of ad libitum feeding. Guinea pigs were long envisioned to be the “Guinea pigs” of space research, too, so they seemed like the obvious choice. Studies on humans are of course desirable, but we feel this current study will be critical in acquiring the attention of granting agencies.

RESULTS:
Mean weight of pigs in space was 0.0000 +/- 0.0002 g. Some individuals weighed less than zero, some more, but those variations were due to reaction to the duct tape, we believe, which caused them to be blamed away against the force plate in the balance. Individuals on the Earth, the control cohort, gained about 240 g/month (p = 0.0002). Males and females gained a similar amount of weight on Earth (no main effect of sex), and size at any point during the study was related to starting size (which was used as a covariate in the ANCOVA). Both Earth and space pigs developed substantial dewlaps (double chins) and were lethargic at the conclusion of the study.

CONCLUSIONS:
Our view that weight and weight gain would be zero in space was confirmed. Although we have not replicated this experiment on larger animals or primates, we are confident that our result would be mirrored in other model organisms. We are currently in the process of obtaining necessary human trial permissions, and should have our planned experiment initiated within 80 years, pending expected review by local and federal IRBs.

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LITERATURE CITED:
Oral Presentations

Common Mistakes

• Reading directly from slides
• Disregard for time constraints
• Not knowing your audience
  • When presenting research, you must consider the level of expertise of your audience
    • Experts
    • Peers
    • Layperson
• Example: Buying a car
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