



# CleanSpaces HealthyPatients™



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Very!



## **PRACTICAL TIPS FOR UNDERSTANDING RESEARCH**

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## Program Objectives

- Identify the basic structure of a research study (plus 10 easy tips to help you!)
- Explain common mistakes and pitfalls to avoid when reading studies
- Describe the basic statistics used in research and how to interpret them

*The presenter has no disclosures*

## Is It *Really* Research . . . ?



### Scientific Research

- Planned, methodological approach based on science
- Seeks to accept or reject a specific research question
- Applies a form of measurement
- Results are analyzed and compared to existing data to the extent possible
- Seeks to uncover new facts or information (scientific inquiry)

Marketing Research is one form of research. It differs in its purpose (understand and influence consumer behavior) and often uses less complex methods or study designs.

## Types of Research Studies

### Randomized, controlled study (RCT)

One type is not "better" than another. It all depends on what you are trying to investigate and the resources that you have

There are different types of studies in between



Most research we use falls in between

The more complex the study, the more time and money it will require. That is a major reason why less complex methods are frequently used

### Case study, case report

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## Studies Use a Basic Presentation Format

- **Article Outline**
- [Abstract](#)
- [Methods](#)
  - [Setting](#)
  - [Case definition](#)
  - [Intervention design](#)
  - [Statistical analysis](#)
- [Results](#)
- [Discussion](#)
- [References](#)
- [Copyright](#)



**WARNING:** You may be tempted to skip from the abstract to the conclusion, but you may miss information if you do!

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## Our Research Example:

### Significant impact of terminal room cleaning with bleach on reducing nosocomial *Clostridium difficile*

- [Donna M. Hacek](#), MT(ASCP)
- [Anna Marie Ogle](#), RN, MPH, CIC
- [Adrienne Fisher](#), MT(ASCP), CIC
- [Ari Robicsek](#), MD
- [Lance R. Peterson](#), MD

**AJIC: American Journal of Infection Control**  
Volume 38, Issue 5, Pages 350-353, June 2010



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## Key Point #1: All Studies Pose a Question (AKA “The Hypothesis”)

Does a specific factor, action or other intervention make a difference? Yes or No?

### Background

We were alerted to increased rates of *Clostridium difficile*-positive tests at all 3 hospitals in our health care system by MedMined Data Mining Surveillance Service, CareFusion (San Diego, CA). In response, an **intervention of terminal room cleaning with dilute bleach was instituted to decrease the amount of *C difficile* environmental spore contamination** from patients with *C difficile* infection (CDI).

Or: Does terminal cleaning with dilute bleach help control C diff?

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## Key Point # 2:

The Design of the Study is Important

1. The sample (who and how many?)
2. The time period (how long?)
3. The measures (how much?)
4. The objectivity (was there bias? Were the results skewed or influenced in some way?)

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## Key Point # 3

Definitions are critical to accurate measurement

### Case definition

- A case of hospital-acquired CDI **was defined as having a positive *C difficile* stool toxin test collected more than 48hours after admission to the hospital.** Toxin results were determined by the *C difficile* Tox A/B II test by TechLab (Blacksburg, Va.). Patients meeting the case definition were determined by running a report on the MedMined Virtual Surveillance Interface

This definition clearly states who was included – and who was not

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## Key Point #4: The Methods Section Provides the Details

### Methods

- The intervention consisted of replacing quaternary ammonium compound as a room cleaning agent with dilute bleach to disinfect rooms of patients with CDI upon discharge. All surfaces, floor to ceiling were wiped with dilute bleach applied with towels to thoroughly wet the surfaces. Daily room cleaning remained unchanged. Patients remained on *C difficile* contact isolation precautions until discharge. To determine the effectiveness of this program, rates of nosocomial CDI for all 3 hospitals were determined using the MedMined Virtual Surveillance Interface for 10 months prior to and 2 years after the cleaning intervention. Statistical significance was determined using Poisson regression analysis.

## Key Point #5: A Study Must Limit the Number of Factors Being Analyzed

### What Was Changed (The Intervention)

Disinfecting the patient room with dilute bleach when the patient was discharged

Washing walls (floor-to-ceiling method) added to terminal cleaning procedure

### What Did Not Change (The Control)

Routine daily room cleaning without bleach

Patient remained on contact precautions

Regular hand hygiene practices

No new products (other than the bleach) were used

## Key Point # 6: Understanding the Results is Easier Than You Think

### Three Commonly Used Measures

1. Mean (average)
2. Standard deviation (SD)
3. P value

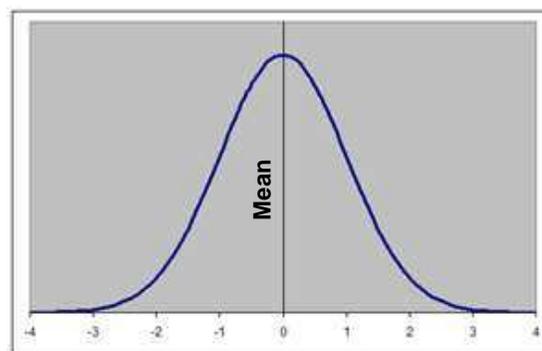


*Unlocking the mystery of basic analysis!*

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## Statistics: Moving Beyond the Mean (Average)



The Normal Distribution

*How much of your data really looks like this?*

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## Key Point # 7: The Mean (Average) When Used Alone Doesn't Tell You Much

**Example:** 10 EVS employees were tested on their knowledge of terminal cleaning procedures. Here are their final scores:

98    72    84    63    79    80    91    78    90    85

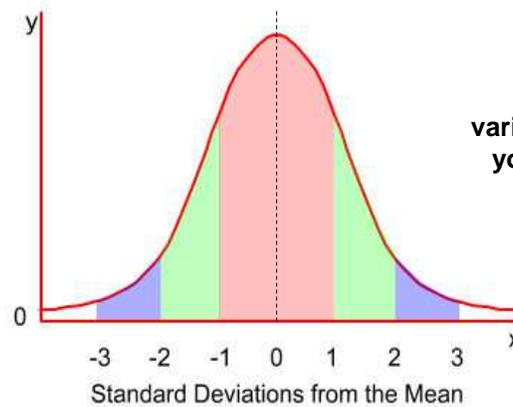
The average score for this group = 82



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## Understanding Standard Deviation (SD)



How much  
variation exists in  
your data set?

The farther away from the center, the greater the variation

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## How Standard Deviation Can Help You

Evaluating employee performance: you have obtained scores from cleaning audits for the following 3 employees.

Employee 1	Employee 2	Employee 3
80	79	87
90	100	94
96	88	80
78	71	96
92	99	79

Mean score for all = 87.

***But are they really the same?***

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## Key Point 8: Standard Deviation Reveals the Variance that the Mean Score Does Not Reflect

Employee 1	Employee 2	Employee 3
87	87	87
<b>SD 7.8</b>	<b>SD 12.6</b>	<b>SD 7.9</b>



Remember: Standard Deviation is included in your basic Excel program

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## What is a p value (and why is it used so often in research studies)?

### Quick facts:

- The p value is not precise. It is about probability.
- The p value tests the evidence so you can decide whether to accept or reject the null hypothesis.
- The null hypothesis is your research question stated in the negative (“no change”)

## The Level of Significance

### *Or how confident am I that this is really true?*

- This is decided by the researcher but often is established at 0.05
- A p value less than 0.05 means you should REJECT the null hypothesis (or, in plain language, your hypothesis IS true . . . probably)
- A level of significance = 0.05 (or 5%) means that you are 95% sure that your original research question was correct.

*This sounds more confusing than it really is . . .*

**Let's Look Again at Our Example:**

**Null hypothesis:** when dilute bleach was added to terminal room cleaning there was NO change in CDI infection rates.

**Level of significance = 0.05 (95%)**

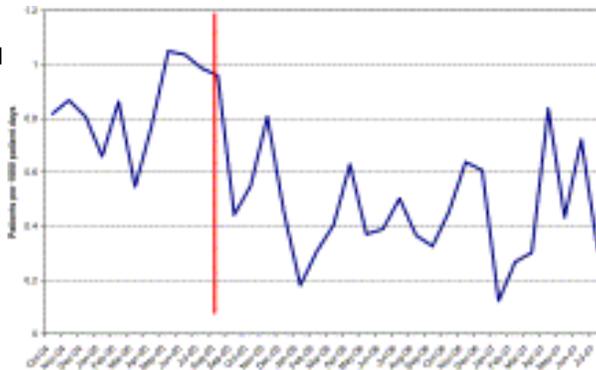
**P value = < 0.0001**

Ask the question: is the p value less than 0.05?

Does the p value indicate that the addition of dilute bleach made a difference?

**Key Point # 9: Data Display is Usually Not Enough for Analysis**

Starting HAI rate: 0.85 CDI cases /1000 patient days



Ending HAI rate: 0.45 CDI cases/ 1000 patient days

Fig 1 Rate of patients with a positive CDI test at hospital day 3 or greater before and after the implementation of a bleach cleaning intervention indicated by the vertical red line.

## Key Point # 10: Use Caution with Conclusions!

**In conclusion**, we demonstrated that implementation of a terminal bleach cleaning program in the rooms of patients with CDI **can have a rapid and sustainable impact on reducing the rate of nosocomial CDI**. This method decreased the prevalence density of *C difficile* in our 3 hospitals, even in the setting of a low endemic rate of disease.

Ask: is the conclusion appropriate for the sample size and study design? Is there overgeneralization? Have the researchers gotten carried away? Is there sign of bias? Do you agree with the conclusion?

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## FAQ: Is Industry Sponsored Research Always Biased?

- High quality research is not determined by the funding source.
- Any study can be good or bad, objective or biased. You must have the skill to read critically, ask challenging questions, understand the statistics and . . .
- Make your own decision



Isn't always about selling a product?

How can I be sure?

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## FAQ: What if New Research Differs from Current Regulations or Standards?

### Requirements exist in many places:

- State and local laws
  - Accrediting standards
  - CMS Conditions for Participation or Coverage
  - OSHA (employees)
  - EPA and FDA label requirements
- and many more!



*What other requirements must you meet every day?*

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### Things to Remember . . . .

- Research is used to develop, revise, challenge and validate standards and regulations.
- Research will always lead regulation. This is intentional and intended for the greater good.
- **If you use new research to attempt to show that current regulations are outdated or incorrect, you must assume the risk for that action.**

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## Research vs. Regulation: Dynamic Tension



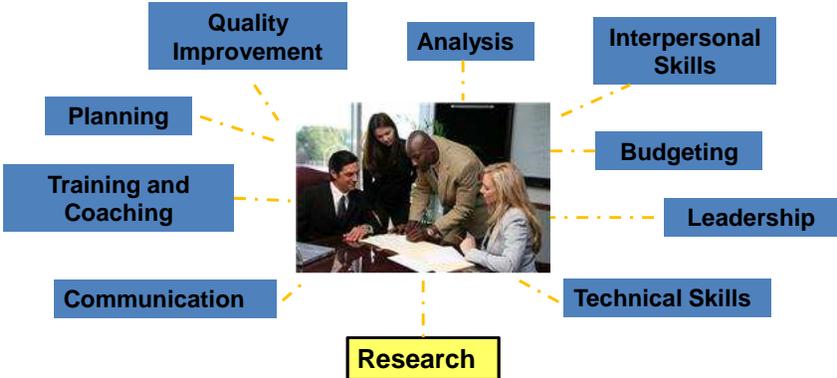
At some point, you will feel  
caught in the middle

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## FAQ: I'm not a scientist. Why is research important to me?

It is a powerful addition to your professional toolkit!



**Research**

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## Ways to Build Your Skills

- Read journals that offer research articles. The more you read, the more you will understand.
- At your next conference, attend a session that describes recent research. Listen carefully to how it is presented.
- Evaluate how research is (or is not) used in the product information you review. How do you rate the quality of the evidence presented?
- Ask to see the evidence behind the claims that someone makes.
- Become an informed consumer of scientific studies

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