Penicillin Allergy Evaluation and Skin Testing

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Abstract #
IRB Approved

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Disclosure

- John Bomkamp, PharmD
- Potential conflicts of interest: None
- Sponsorship: None
- Penicillin skin testing at OSUMC
- Proprietary information or results of ongoing research may be subject to different interpretations
- Speaker's presentation is educational in nature and indicates agreement to abide by the non-commercialism guidelines provided.

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Objectives

1. Describe the process of penicillin allergy evaluation.
2. Identify patients that could benefit from penicillin skin testing.

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Penicillin Skin Testing – Why?

- Approximately 10-15% of patients report a penicillin allergy
  - Up to 90% are not allergic
  - 80% with IgE-mediated penicillin allergy lose sensitivity after 10 years
- Estimated up to 98% of patients tested would have a negative result

Raja A et al. *Ann Emerg Med* 2009;54:72-7.
Macy E et al. *J Allergy Clin Immunol* 2014;133:790-6.

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Penicillin Skin Testing – Why?

- Increased risk of treatment failure, ICU admission rate, length of stay, and mortality
  - β-lactam often drug of choice for a variety of infections
- More likely to receive fluoroquinolones, cefepime, and carbapenems
  - Risk for selection of resistant gram negative bacteria
- Higher incidence of *C. difficile*, MRSA, and VRE infections
- Potential for cost savings in patients tested

Estep PM et al. *Am J Health-Syst Pharm* 2016;7:S8-13.
Jones BM et al. *Am J Health-Syst Pharm* 2017;232-37.

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Penicillin Skin Testing – What?

- Pre-Pen™ penicillin allergy testing kit
  - Benzylpenicilloyl polylysine
  - Histamine
- Normal saline
- Penicillin G – 10,000 units/mL
- Negative predictive value – 99%

https://penallergytest.com.

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Penicillin Skin Testing – How?

- Step 1 – Scratch Test
  1. Clean and mark skin
  2. Apply 1 drop of each reagent to each section
  3. Use scratching device to scratch the surface of the skin
  4. Set timer to 15 minutes
  5. Use reaction guide to review results

https://penallergytest.com.

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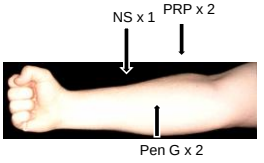
Penicillin Skin Testing – How?

- Step 2 – Intradermal Test
  1. Clean and mark skin of opposite forearm
  2. Use Pre-Pen™ and Pen G to inject 2 blebs of 2-3 mm in diameter
  3. Set timer to 15 minutes
  4. Use reaction guide to review results



https://penallergytest.com.

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Research Project: Institution

- Oklahoma State University Medical Center
  - Located in downtown Tulsa, Oklahoma
- Affiliated with the Oklahoma State University Center for Health Sciences
- Largest osteopathic teaching facility in the nation

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Research Project: Overview

- Study design
  - One – year retrospective observational study
- Purpose
  - Quantify impact of broad-spectrum antibiotic utilization if penicillin skin testing had been performed
  - Determine cost savings for patients receiving penicillin skin testing
- Data collection
  - Antibiotics prescribed
  - Days of therapy
  - Appropriateness of therapy

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Research Project: Inclusion and Exclusion Criteria

- Inclusion
  - Age ≥ 18 years
  - Documented penicillin allergy
  - Administered antimicrobial therapy while admitted
- Exclusion
  - Age < 18 years
  - Documented anaphylaxis to penicillin

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Research Project: Results

- Initial data collection resulted in 75 patient charts to evaluate
- 62 patients met inclusion criteria
  - 13 patients excluded due to anaphylaxis listed as their reaction to penicillin
- 43 patients (69.4%) could have benefited from penicillin allergy testing
  - 27 patients (43.5%) received a penicillin-based antibiotic without documentation of tolerability

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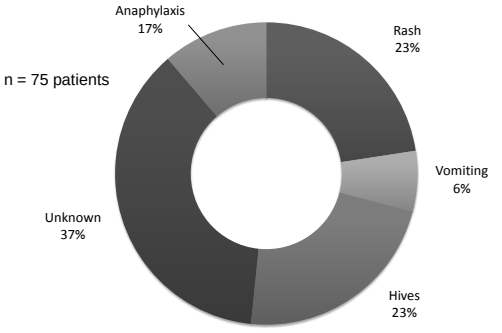
Types of Allergies



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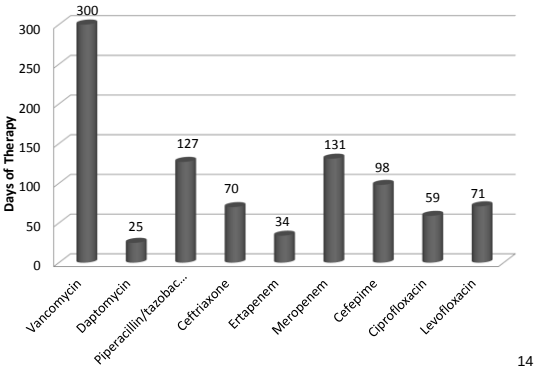
Broad-Spectrum Antibiotic Days of Therapy



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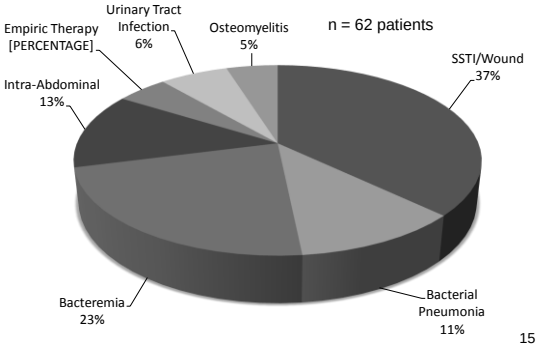
Types of Infections



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Research Conclusions

- Patients with a penicillin allergy tend to receive longer courses of broad-spectrum antibiotics.
  - E.g. Vancomycin and carbapenems
- Discussion with the patient regarding their penicillin allergy history and appropriate documentation may enable safe administration of a penicillin antibiotic without the need for skin testing.
- Skin and soft tissue infections, bacteremia, and pneumonia represent the most common types of infection in which penicillin skin testing could be useful at OSUMC.

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Who Could Benefit from Penicillin Skin Testing?

- Potential uses
  - Infections requiring prolonged courses of antibiotics
  - Infections due to:
    - *Streptococcus spp.*
    - *S. aureus* (MSSA)
    - *E. faecalis*
    - *T. pallidum*
- Exclusions
  - Anaphylaxis of any kind within the last 4 weeks
  - History of SJS/TEN
  - HIV with CD4 < 500 cells/mm^3
  - Cystic fibrosis
  - Neutropenia (ANC < 1000 cells/mm^3)

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Jones BM et al. *AM J Health-Syst Pharm* 2017;232-37.

Summary

- Penicillin skin testing provides clinicians a method to exclude an IgE-mediated reaction prior to administration of a penicillin-based antibiotic.
- Penicillin skin testing consists of the scratch test, intradermal test, and an option oral challenge or test dose with the antibiotic of choice.
- An in-depth review of a patient's allergy history may allow an allergy to be removed without the need for skin testing.

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Self-Assessment Questions

1. During the intradermal portion of the test, what should the practitioner do after injecting each bleb?

   A. Set the timer to 15 minutes
   B. Use the reaction guide to review the results
   C. Administer the penicillin-based antibiotic of choice
   D. Circle each bleb to monitor bleb growth during the test.

2. Which of the following patients could potentially benefit from penicillin skin testing?

   A. A 63-year-old male with cellulitis due to MSSA. He reports a penicillin allergy and he remembers a severe reaction. He recalls that the physician mentioned Stevens-Johnson.
   B. A 73-year-old female with pneumonia due to *P. aeruginosa*. The medical record lists her allergy as hives. When you speak with her family they mention she was hospitalized a couple weeks ago with an anaphylactic reaction to an unknown allergen.
   C. A 47-year-old male with Enterococcal endocarditis that is ampicillin-susceptible. He reports his reaction to penicillin was hives several years ago.
   D. A 59-year-old female with MRSA osteomyelitis. She states her mother told her she was allergic to penicillin when she was a little girl.

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