# Penicillin Allergy Evidence Table 2021

| Source | Recommendations(s)/Themes | Outcome(s) | Implications for Quality Improvement | Supporting Evidence (Additional References) |
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| Stone, C. A., Trubiano, J., Coleman, D. T., Rukasin, C. R. R. & Phillips, E. J. (2020). The Challenge of De-labeling Penicillin Allergy. Allergy 75(2), 273-288, doi: 10.1111/all.13848 | • Evidence Based Practice (EBP) narrative review of the literature of penicillin allergy labeling.<br>• Adverse effects of penicillin allergy labels and current approaches.<br>• Lists barriers to penicillin allergy de-labeling.<br>• Lists prevalence of penicillin allergy compared to actual incidence.<br>• Traditional "allergy box" does not include details of the reaction<br>• Most labels are acquired in childhood.<br>• "Over 90% of patients can have their penicillin allergy label removed by formal testing. *testing for appropriate penicillin allergy." | "Negative consequences of Penicillin Allergy labels include:<br>• Leads to avoidance of prescribing other betalactam antimicrobials<br>• Alternative antimicrobials often have decreased efficacy<br>• Studies have shown patients with penicillin allergy have increased LOS, increased readmissions, greater risk for multidrug resistant infections<br>• Delabeling penicillin allergy is cost effective" | Appropriate labeling of penicillin allergy. | 154 supporting articles from the literature review. |
| Blumenthal, K. G., et al. 2019. Outcomes from an inpatient beta-lactam allergy, guideline across a large US health system. Infection Control Hospital Epidemiology, 40(5): 528–535. doi: 10.1017/ice.2019.50 | • "To assess the safety of, and subsequent allergy documentation associated with, an antimicrobial stewardship intervention consisting of test-dose challenge procedures prompted by an electronic guideline for hospitalized patients with reported β-lactam allergies."<br>• Retrospective cohort study, large healthcare system with 2 academic and 3 community acute-care hospitals. | Test doses were predominantly to cephalosporin antibiotics<br>• "The antimicrobial stewardship intervention using β-lactam test-dose procedures was safe."<br>• "Encouraging EHR documentation might improve this safe, effective, and practical acute-care antibiotic stewardship tool." | Algorithm (guideline) on pages 532-533 of article with implementation instructions.<br>Accurate allergy documentation in the electronic health record. | 42 supporting references |

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| | • "…Evaluated β-lactam antibiotic test-dose outcomes, including adverse drug reactions (ADRs), hypersensitivity reactions (HSRs),and electronic health record (EHR) allergy record updates. HSR predictors were examined using a multivariable logistic regression model. Modification of the EHR allergy record after test doses considered relevant allergy entries added, deleted, and/or specified"<br>• Guideline can be used for all adults, children, and pregnant women in all care units | | | |
| Blumenthal, K. G. et al (2020). High-Cost High-Need Patients. The Impact of Reported Penicillin Allergy. American Journal of Managed Care, 26(4), 154-161. doi: 10.37765/ajmc.2020.42832 | • Objectives: "Over 90% of patients who report a penicillin allergy have the allergy disproved when tested. Unnecessary use of alternative (non-beta-lactam) antibiotics can result in more treatment failures and adverse reactions."<br>• "Described the prevalence and impact of a reported penicillin allergy in high-cost high-need (HCHN) patients."<br>• Methods: "Identified HCHN patients in a care management program of an urban academic medical center." | "HCHN patients had a high burden of reported drug allergy. A reported penicillin allergy conferred a 4-fold increased odds of alternative antibiotic use. Reporting penicillin allergy, with and without multiple drug intolerance syndrome, was associated with significantly more healthcare utilization. HCHN care management programs should consider systematic drug allergy evaluations to optimize antibiotic use in these fragile patients."<br>"HCHN patients are ideal candidates for systematic drug allergy evaluations, including penicillin allergy testing, to optimize first-line antibiotic treatments." | Consider systematic drug allergy evaluations to optimize antibiotic use in high-cost, high-need patients. | 41 supporting references. |

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| Desravines, N., Waldron, J., Venkatesh, K. K., Kwan, M. & Boggess, K. A. (2021). Outpatient Penicillin Allergy Testing in Pregnant Women Who Report an Allergy. Obstetrics and Gynecology, 137(1), 56-61. doi: 10.1097/ | • "Estimate the feasibility, acceptability, and safety of outpatient penicillin allergy testing among pregnant women"<br>• "Conducted a prospective cohort study at a large academic hospital from March 2019 to March 2020."<br>• "Recruited pregnant women with a self-reported penicillin allergy who underwent allergy testing.<br>46 women tested with 93% negative test results" | "Outpatient penicillin allergy testing is acceptable and feasible in pregnancy." | Consider outpatient testing for penicillin allergy<br>*See testing protocol on pages 57-58. | Small sample size<br>18 References |
| Jeimy, S., Ben-Shoshan, M., Abrams, E. M., Ellis, A. K., Connors, L. & Wong, T. (2020). Practical guide for evaluation and management of beta-lactam allergy: position statement from the Canadian Society of Allergy and Clinical Immunology. Allergy Asthma Clinical Immunology, 16(95), https://doi.org/10.1186/s13223-020-00494-2 | "10% of the Canadian Population carry the PCN allergy label."<br>"Vast majority – up to 98% are beta-lactam tolerant after appropriate assessment. Risks associated with beta-lactam allergy include increased use of second-line or broad coverage antimicrobial treatments which may have lesser efficacy and higher risk of adverse outcomes including increased LOS, increased risk of antibiotic-resistance, increased risk of *C-diff*, antimicrobial toxicity and increased costs."<br>• "Recommendations on how to stratify risk of beta-lactam allergy, based on clinical assessment."<br>• "Recommendations on beta lactam challenge protocols."<br>• "Guidance for management of patients at high risk of beta-lactam allergy." | • Table 1 lists the clinical spectrum of beta-lactam hypersensitivity.<br>• Table 2 lists clinical assessment questions to investigate reaction history.<br>• Figure 1 lists the decision tree for administering beta-lactam antimicrobial.<br>• Table 4 is the graded challenge and suggested protocol and medications.<br>• Table 5 is a letter template for after provocation challenge to evaluate beta-lactam allergy. | All of the resources in the article would be helpful in establishing a beta-lactam challenge program for any size facility. | 55 references and links to other protocols. |

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| Wolfson, A. R., Huebner, E. M. & Blumenthal, K. (2019). Acute Care Beta-Lactam Allergy Pathways: Approaches and Outcomes. Annals of Allergy Asthma Immunology, 123(1), 16-34, doi:10.1016/j.anai.2019.04.009 | • "10% of patients report a penicillin allergy, up to 15% of hospitalized patients report a penicillin allergy"<br>• "Hospitalized patients with infections often unnecessarily avoid penicillin and other beta-lactams, such as the cephalosporins."<br>• "Avoidance of beta-lactams can lead to adverse effects."<br>• "Beta-lactam allergy pathways are– history based, drug challenge based, PST-based, comprehensive." | Pathways and protocols are listed in the appendices of the article.<br>"The article lists Beta-lactam allergy pathways to provide safe frameworks to challenge penicillin or indicated beta-lactams to improve patient care"<br>"All pathways reported improvements in antibiotic stewardship outcomes with appropriate safety profiles." | Implementation of pathways described in detail in the article. | 58 reference articles |
| Vyles, D. et al (2020). Children with Reported Penicillin Allergy: Public Health Impact and Safety of De-labeling. Annals of Allergy Asthma and Immunology, 124(6), 558-565, doi:10.1016/j.anai.2020.03.012 | • Article describes risk of PCN allergy in pediatric patients "When a PCN allergy is reported in a child there are increased costs to both families, and healthcare systems"<br>• "The presence of a reported PCN allergy also leads to adverse health outcomes such as an increase in hospital acquired infections, increased hospital length of stay, increased resistance due to alternative antibiotics and increased morbidity and mortality"<br>• "In children with reported allergy to beta-lactam antibiotics, skin testing followed by drug challenge has been shown to be an effective process to de-label those with reported allergy." | • "PCN allergy is over-diagnosed, often incorrect, and the label is frequently first applied during childhood."<br>• "Targeting children for PCN allergy label removal provides a mechanism to reduce a lifelong use of broader spectrum and less effective antibiotics."<br>• Testing and recommendations are listed in the appendixes of the article. | Peds- PCN Allergy de-labeling and protocols implementation. | 50 reference articles including a large sample of Peds patients for PCN allergy challenge protocol. |

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| Blumenthal, K. G. et al (2017). Addressing Inpatient Beta-Lactam Allergies: A Multi-Hospital Implementation. Journal of Allergy and Clinical Immunology Practice, 5(3), 616-625, doi:10.1016/j.jaip.2017.02.019 | • "Key principles in designing the guideline and tools that we used, and explain effective implementation steps: assembling a team, gaining stakeholder engagement, developing or selecting an approach, spreading the change, establishing measures, and evaluating impact. The objective is to detail the lessons we learned in this process, as well as empower allergists to join multi-disciplinary teams across the United States tasked to improve the care of patients with reported beta-lactam allergies." | • Step-by-Step implementation guidelines for a beta-lactam allergy protocol/program.<br>• Pathway for general inpatient providers<br>• Appendices list step by step instructions for implementing a penicillin allergy protocol. | • Quality improvement implementation steps using an electronic protocol. | 57 reference articles |
| Blumental, K. G. et al (2017). Tackling inpatient penicillin allergies: Assessing tools for antimicrobial stewardship. Journal of Allergy Clinical Immunology, 140(1), 154-16. doi:10.1016/j.jaci.2017.02.005. | • "Reported penicillin allergy rarely reflects penicillin intolerance. Failure to address inpatient penicillin allergies results in more broad-spectrum antibiotic use, treatment failures, and adverse drug events."<br>• "Aim to determine the optimal approach to penicillin allergies among medical inpatients."<br>• "Evaluated internal medicine inpatients reporting penicillin allergy in three periods: (1) standard of care (SOC), (2) penicillin skin testing (ST), and (3) computerized guideline application with decision support (APP)." | • "Improved antibiotic choice among medical inpatients reporting prior penicillin allergy was achieved using a computerized guideline, which resulted in an overall significant increased odds of penicillin or cephalosporin use compared to standard of care (aOR 1.8 [95% CI 1.1, 2.9])."<br>• "Both the computerized guideline with decision support and penicillin skin testing – when completed – increased use of penicillin and cephalosporin antibiotics among inpatients reporting penicillin allergy."<br>• "While the skin tested subset showed an almost 6-fold impact, the computerized guideline significantly increased penicillin or cephalosporin use overall nearly 2-fold and was readily implemented." | • Implementing computerized guidelines with decision support | 50 reference articles |

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| Chen, J. R., Tarver, S. A., Alvarez, K. S., Wei, W. & Khan, D. A. (2018). Improving Aztreonam Stewardship and Cost Through a Penicillin Allergy Testing Clinical Guideline. Open Forum Infectious Diseases, | • "Clinical decision support tool incorporated in the electronic medical record which directed providers."<br>• "An allergy-trained pharmacist reviewed orders placed through this new guideline and performed skin testing and oral challenges to determine whether these patients could safely take penicillin."<br>• "Data on tests performed, antibiotic utilization, and cost-savings were compared with patients tested outside the new guideline as part of the institution's standard stewardship program." | • "The guideline significantly increased penicillin allergy testing among patients receiving aztreonam from 24% to 85% (P < .001) while reducing the median delay between admission and testing completion from 3.31 to 1.05 days (P = 0.008)."<br>• Significant cost savings described in the article. | • A cost-effective model for inpatient testing | 33 References |

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