

Penicillin Allergy: A Revisit for Nurse Practitioners



Nurse practitioners (NPs) are well informed about medication allergy, especially when it comes to caring for their patients. The topic of penicillin (PCN) allergy is familiar but one of the most important topics for all clinicians. NPs should be reminded to carefully consider each and every patient encountered who reports a PCN allergy by reviewing the known and unknown of who is reporting the allergy, what kind of reaction the patient previously experienced, and what constitutes a true allergy.

Approximately 10% of patients report a history of PCN allergy and many (approximately 90%) of these will have a negative PCN skin test.^{1,2} It is estimated that 94% of subjects wrongly believe that they are allergic to PCN.¹⁻³ The reality is that many patients (approximately 80%) “outgrow” these allergies within 10 years (allergic reactions can wane or disappear over time, and patients lose their sensitivity).^{1,2}

PCNs are effective antibiotics and considered first-line treatment for many significant infections. If patients are wrongly labeled as having “PCN allergy,” it can result in less effective treatments, use of alternative antibiotics with more side effects, and issues with antibiotic resistance.^{1,2} Many patients may have developed intolerance to PCN related to side effects such as gastrointestinal symptoms rather than true allergies, so they may report that they have a PCN allergy when in actuality, it is not a true PCN allergy.^{1,2,4} For NPs to appropriately treat their patients, it is important to identify those patients with true PCN allergies versus those who have simply side effects from PCN.

PCN antibiotics have only a 0.004%–0.015% risk for causing anaphylaxis reactions and even lower risk (0.0001%–0.1%) for cephalosporins, essentially making anaphylaxis rare.⁵ The rate of cross-reactivity between PCN

and cephalosporins is also low and has been grossly overestimated.⁵ PCN and cephalosporin antibiotics do have similar beta-lactam ring structures. However, PCN structures have a 5-membered thiazolidine ring, whereas cephalosporin structures have a 6-membered dihydrothiazine ring. PCNs degrade to form a stable penicillate ring with an intact thiazolidine ring



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versus a fragmentation of the beta-lactam and dihydrothiazine rings for cephalosporins.⁵ It is confirmed by monoclonal antibody analysis that the immunologic cross-reactivity between the 2 is minimal. Early reports of the cross-reactivity between PCN and cephalosporin antibiotics are approximately 10% and primarily involved the first-generation cephalosporins, but the latest available information reveals that the rate of cross-reactivity for second-, third-, and fourth-generation cephalosporin and PCN is low.^{2,4}

Penicillin-specific immunoglobulin (Ig)E antibodies mediated reaction is considered severe. Signs and symptoms related to this type of reaction tend to be prominent and include anaphylaxis, angioedema, hypotension, hives and itchy rash, and swelling of the larynx; these are typically seen within 72 hours of PCN use.² Other types of PCN reactions may occur after 72 hours of use, and these are often mediated by IgG antibodies and complement IgG and IgM immune complexes, T lymphocytes, or

Table. Safe Medication Use^{1,2}

- Obtain up-to-date allergy information.
- Perform a thorough history.
- Determine signs of true allergy versus side effects.
- Nonitching rash to penicillin is not a contraindication for cephalosporin use.
- Educate patients about true allergy versus side effects.
- Educate patients about resistance issues associated with antibiotics use.
- Continue to avoid penicillin with severe reactions (e.g., anaphylaxis, hives, angioedema).
- Refer for penicillin skin test as needed.
- Finally, update patient profiles with the latest findings.

idiopathic reactions. Examples of these types of PCN reactions are hemolytic anemia, rash, eosinophilia, contact dermatitis, and others. Patients with idiopathic reactions tend to tolerate PCN antibiotics at a later use.²

Penicillin allergy is one of the most common antibiotic-related issues that NPs come across. Because of concerns over a serious allergic reaction like anaphylaxis, NPs may choose to use alternative antibiotic agents, which are sometimes inappropriate and less effective, have a broader spectrum of activities, and are also often costlier. The Table lists some considerations for NPs to practice safe medication use when confronted with issues related to PCN allergy.² An antibiotic stewardship program that included careful assessment of antibiotic allergy led to greater use of beta-lactam antibiotics without an increase in

side effect—related events.⁴ In addition, patients were exposed to fewer broad-spectrum antibiotics and lower medication costs.

NPs can be leaders in antibiotic stewardship and have a major impact on patient care and health care, including cost, efficacy, and emerging antibiotic resistance issues. NPs' careful assessment of nonimmunologic side effects such as nausea, vomiting, diarrhea, nonspecific rash, or other toxic effects versus confirming true "allergic reactions" will help improve overall patient care. **JNP**

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