Promoting Cephalosporin Utilization for Surgical Antibiotic Prophylaxis in Non-severe Penicillin Allergies

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The use of cephalosporin antibiotics as surgical prophylaxis has historically been avoided in patients with a penicillin allergy due to perceived high rates of cross-reactivity [1]. However, more contemporary data have established cross-reactivity rates to be closer to 1% [1,2]. Furthermore, only 7-23% of children with a reported penicillin allergy have a true allergy based on skin testing, with the remainder of "allergies" largely attributable to enteral intolerance symptoms such as nausea, vomiting, and diarrhea [3–6]. Avoidance of cephalosporins in these patients has been associated with increased use of broader spectrum second line antibiotics such as vancomycin, which has the potential to increase antibiotic resistance [7–9]. Finally, use of second line agents has been associated with increased rates of surgical site infections and adverse drug reactions compared to use of cephalosporins [10–16]. Given these considerations, cephalosporins should be considered first-line surgical antimicrobial prophylaxis for all patients without a history of severe penicillin allergies.

Project overview

The goal of this process improvement project is to reduce practice variation and inappropriate use of second line agents for surgical prophylaxis in patients with mild to moderate penicillin-allergies. Barriers to appropriate cephalosporin utilization include poor documentation of allergic response (i.e., the "information gap"), precluding accurate assessment of the presence and severity of a true allergy at the point of care, and lack of education regarding the safety of cephalosporin use in non-severe penicillin allergies (i.e., the "knowledge gap") [17,18].

The interventions described below aim to address both of these barriers through a multidisciplinary and multi-pronged process improvement effort. The project can be rolled out in stages (first improving penicillin-allergy reaction documentation, then focusing on reducing the use of second line agents in patients with non-severe penicillin allergies), or addressing improved documentation and antibiotic compliance simultaneously. We strongly recommend a multi-pronged approach addressing both documentation and antibiotic use for maximal effect.

Project strategy and intervention

The proposed strategy has been developed from an analysis of primary drivers of noncompliance and successful implementation at a freestanding children's hospital. The identified primary drivers of noncompliance include:

1. Poor documentation of allergic response, precluding accurate assessment of the presence and severity of a true allergy at the point of care

2. Lack of awareness regarding the safety of cephalosporin use in non-severe penicillin allergies

With these primary drivers in mind, the project is composed of the following steps and interventions.

- Caregiver outreach to clarify incomplete allergy documentation
- Creation of a decision-support algorithm for SAP use in penicillin-allergic patients
- Standardized educational resources for surgical faculty and rotating trainees
- Education of attending surgeons in a faculty meeting around current guidelines and the harm of second line agent utilization
- Proactive education of rotating residents around departmental SAP guidelines and communication loop closure to facilitate compliance
- Email reminders with prophylaxis recommendations sent out prior to scheduled cases
- EMR-based decision support during antibiotic ordering
- Auditing of compliance with SAP guidelines for targeted cases
- Feedback to surgical attendings and residents in cases of noncompliance

Resources

To support project success, multiple resources are included in the project file. These include:

- A sample multidisciplinary algorithm to guide prophylactic antibiotic choice in the setting of a beta-lactam allergy
- A presentation file to facilitate discussion & endorsement of the project at a departmental/faculty meeting. The presentation contains information regarding current safety of cephalosporin utilization in the setting of a non-severe penicillin allergy and risks of second line agent utilization
- A document including several email templates for faculty and rotating residents/trainees. The file includes multiple email templates including announcements of the guidelines/project to both surgical attendings and rotating residents, recommendations for prophylaxis for upcoming cases with penicillin-allergic patients, and emails to assess reasons for second line agent utilization in noncompliant cases
- A spreadsheet to facilitate auditing and to monitor antibiotic compliance rates over time
- An example of an automatically generated report of upcoming procedures involving patients with beta-lactam allergies that includes the case, allergic agent, and allergic reaction to guide prophylaxis recommendations

Recommended project roll out strategy

The recommended strategy for roll-out is as follows:

1. Create a multidisciplinary algorithm to guide surgical prophylaxis choice in the setting of a beta-lactam allergy with input from Allergy/Immunology, Infectious Disease, Pharmacy, and Surgery. The attached algorithm can be used as a template and conceptual

framework, however, this should be endorsed by your hospitals infectious disease and allergy/immunology departments.

2. Create a workflow to clarify allergic reactions for upcoming cases with patients with penicillin allergies with incomplete documentation. This may be done through EMR chart review and contacting caregivers by phone or email. This may be best accomplished for scheduled cases that are seen in surgery clinic by incorporating allergy evaluation into standard workflow.
3. Present PowerPoint at faculty meeting; establish consensus around goals to improve antibiotic prophylaxis compliance; assess concerns and misconceptions.
4. Send out education/announcement emails to current residents (and obtain a schedule of future resident rotations so they can be sent the emails when they begin); mandate communication loop closure with an email response that they understand and will comply with the guidelines.
5. Send out templated reminder email to faculty about the consensus agreement established in faculty meeting and plans to begin auditing (when auditing begins).
6. Work with EMR/IT contacts to incorporate decision support at the point of order entry for prophylaxis in children with documented penicillin allergies.
7. Work with EMR/IT to create an automatically-generated report of upcoming cases involving patients with penicillin or cephalosporin allergies.
8. Send out templated emails to faculty and residents to provide prophylaxis recommendations for upcoming cases involving patients with penicillin or cephalosporin allergies.
9. Send out templated emails to faculty and residents for noncompliant cases as a reminder and to assess reasons for noncompliance.

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