The Next Frontier: Outpatient Penicillin Allergy Delabeling

Jacob Langness, PharmD, BCPS
Michele Granada, MD, FACP, FIDSA

Allina Health

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Disclosure

- Jacob Langness: I have nothing to disclose.
- Michele Granada: I have nothing to disclose.

Objectives

- To review the evidence and safety for outpatient penicillin allergy delabeling and amoxicillin oral challenges.
- To discuss the creation and implementation of the current quality improvement pilot project.
- To review the available data from the interim analysis.
- To discuss both successes and challenges in the widespread implementation this project.
- To apply these lessons to real patient cases.

Why do we care?

The American Academy of Allergy, Asthma, and Immunology (AAAAI) 2022 guideline recommends proactive efforts to de-label penicillin allergies

Increased antibiotic resistance
14.1% more MRSA
30.1% more VRE

50% increase in
surgical site incidence

Increased antibiotic cost,
length of stay,
readmission rate

23.4% increase
in *C diff* rate

14% increase in mortality

- Khan DA, Banerji A, Blumenthal KG, et al. Drug allergy: A 2022 practice parameter update. J Allergy Clin Immunol. 2022;150(6):1333-1393. doi:10.1016/j.jaci.2022.08.028

How big of an issue is this?

- Penicillin is the most reported antibiotic allergy
- Between 10%-20% of the US population reporting a reaction
- However, when further tested, 95% of these patients could tolerate a penicillin antibiotic.[1]

Gonzalez-Estada A, Radojicic C. Penicillin Allergy: A Practical Guide for Clinicians. Cleve Clin J Med. 2015;82(5):295-300. doi: 10.3949/ccjm.82a.14111

PALACE Randomized Control Trial

Proof of Concept

- Compared standard of care: allergy skin testing followed by oral challenge to the use of PENFAST scoring to risk stratify
  - Score 0-2: low risk, randomized to standard of care (control group) or direct oral challenge (intervention group)
  - Score 3-5: Excluded
- 377 patients: 187 in the intervention group and 190 in the control group.
  - Most patients had a PEN-FAST score of 0 or 1.
  - The primary outcome (allergic reaction) occurred in 1 patient (0.5%) in the intervention group and 1 patient (0.5%) in the control group.
  - In the 5 days following the oral penicillin challenge, 9 immune-mediated adverse events were recorded in the intervention group and 10 in the control group. No serious adverse events occurred.

Copaescu AM, Vogrin S, James F, et al. Efficacy of a Clinical Decision Rule to Enable Direct Oral Challenge in Patients with Low-Risk Penicillin Allergy – The PALACE Randomized Clinical Trial. JAMA Intern Med. Published online July 17, 2023. doi:10.1001/jamainternmed.2023.2986

Abbott Northwestern Inpatient Data

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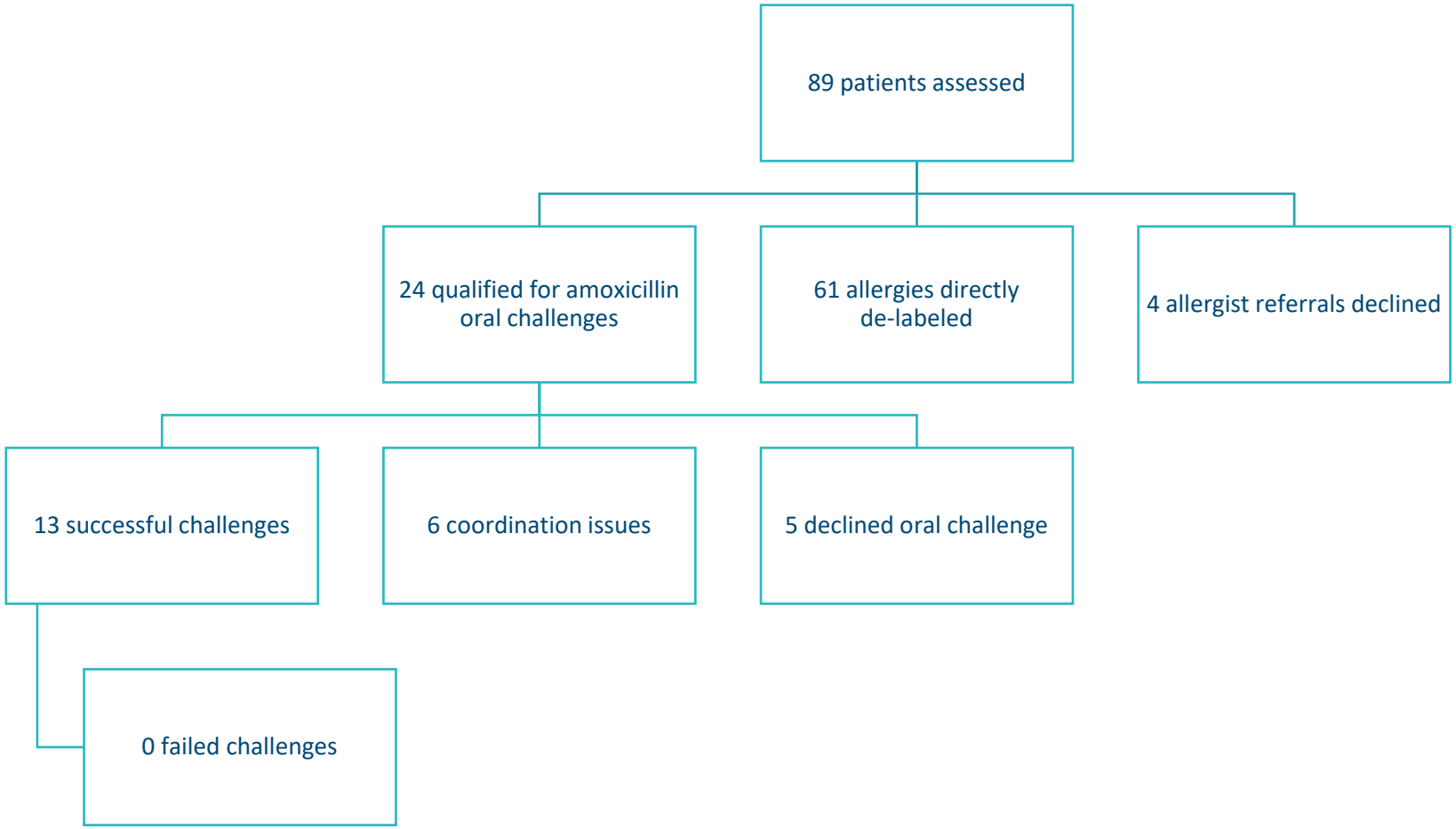
0.2 FTE for 20 weeks



How big of an issue is this?

- Penicillin is the most reported antibiotic allergy
- Up to 10% of the US population reporting a reaction
- However, when further tested, 95% of these patients could tolerate a penicillin antibiotic.[1]

- Allina Health: almost 1.5 million patients seen at outpatient encounters in 2024
  - 150,000 reported allergies
- ANGMA Group: Approximately 25,000 patients
  - 2500 reported allergies
- ANGMA General Medicine Clinic: Approximately 2,000 patients

Gonzalez-Estada A, Radojicic C. Penicillin Allergy: A Practical Guide for Clinicians. Cleve Clin J Med. 2015;82(5):295-300. doi: 10.3949/ccjm.82a.14111

Outpatient PCN Allergy Delabeling Pilot Expansion

- Created a QI project involving clinical pharmacy, medical residents and attendings, and clinic manager/nursing
  - Michele Granada, MD, ID
  - Peter Lund, MD, IM Attending
  - Jacob Langness, PharmD
  - April Mannhardt, Clinic Manager, Nursing
  - Morgan Kelly, MD, IM Resident
  - Danielle Mangine, Allysa Welle, IM Residents

What are the challenges to fitting into outpatient workflow?

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- How do we identify patients?
- Who screens the patients (using PENFAST)?
- Is this the same person who would order oral challenge?
- How long does it take?
- Do we use the same protocol as inpatient?
- What if there is a severe reaction?
- Is this a billable visit? Does insurance pay for it?

What are the challenges to fitting into outpatient workflow?

- **How do we identify patients**?
  - Generally review allergies through rooming (MA, LPN, RN)
  - Rarely would we look ahead at allergies
  - No specific process to “Flag” certain allergies
  - Build a report – can go through Slicer Dicer – which we found accurate and straightforward
    - But would not screen in real time

What are the challenges to fitting into outpatient workflow?

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How do we identify patients?

Who screens the patients (using PENFAST)?

Is this the same person who would order oral challenge?

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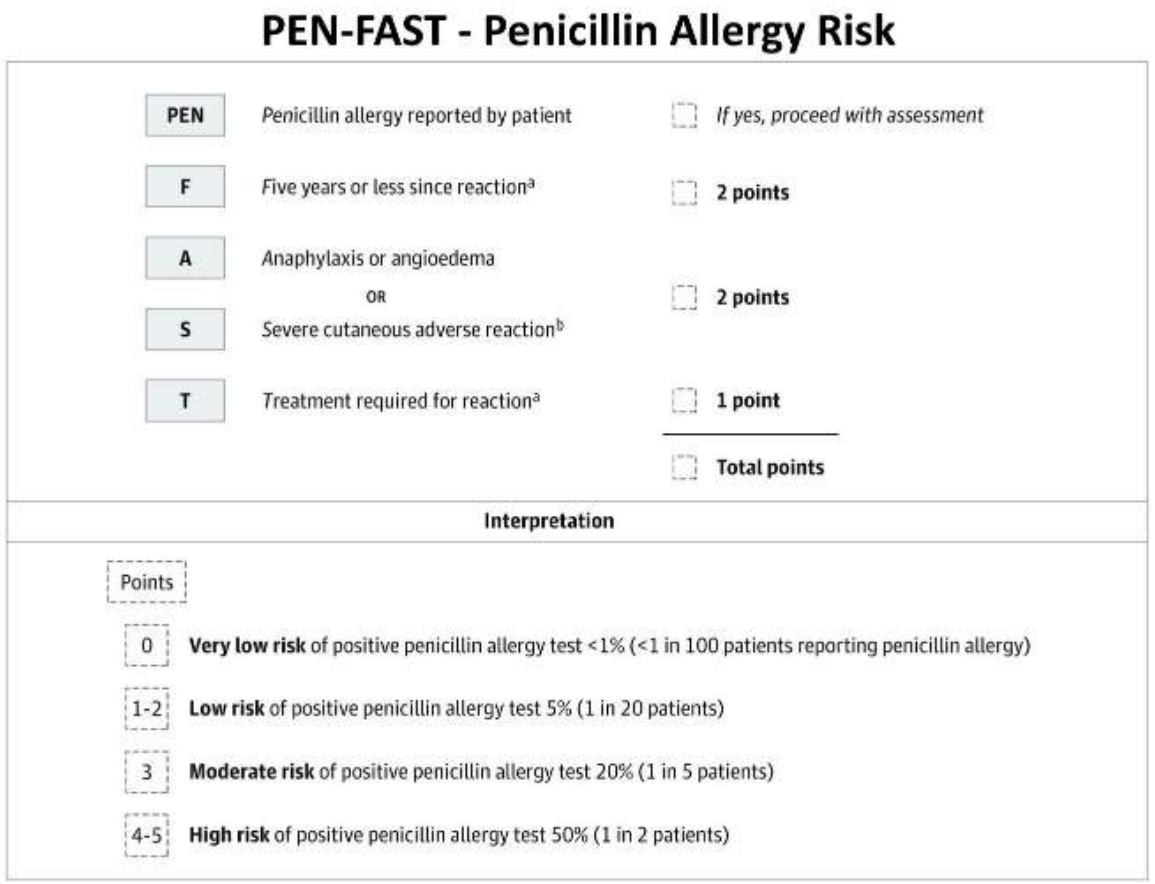
Do we use the same protocol as inpatient?

What if there is a severe reaction?

Is this a billable visit? Does insurance pay for it?

“Straightforward” Screening



PEN-FAST - Penicillin Allergy Risk

PEN	Penicillin allergy reported by patient	☐ *If yes, proceed with assessment*
F	Five years or less since reaction[a]	☐ **2 points**
A	Anaphylaxis or angioedema	
	OR	☐ **2 points**
S	Severe cutaneous adverse reaction[b]	
T	Treatment required for reaction[a]	☐ **1 point**
		☐ **Total points**

Interpretation

Points	
0	**Very low risk** of positive penicillin allergy test <1% (<1 in 100 patients reporting penicillin allergy)
1-2	**Low risk** of positive penicillin allergy test 5% (1 in 20 patients)
3	**Moderate risk** of positive penicillin allergy test 20% (1 in 5 patients)
4-5	**High risk** of positive penicillin allergy test 50% (1 in 2 patients)

- First appears quick and straightforward
- 5 years since last reaction –
  - If it is not within our health system, sometimes unclear
- Anaphylactic angioedema or severe cutaneous adverse reaction
  - Often asking about reactions that occurred as a child (so parent reported)
- Treatment required for reaction
  - Rarely do they know the answer to this

Trubiano JA, Vogrin S, Chua KYL, Bourke J, Yun J, Douglas A, Stone CA, Yu R, Groenendijk L, Holmes NE, Phillips EJ. Development and Validation of a Penicillin Allergy Clinical Decision Rule. JAMA Intern Med. 2020 May 1;180(5):745-752. d

Are you intolerant, allergic, or infected?

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Potentially Symptoms of Intolerance

- GI symptoms
- Rash
- Hemolytic anemia
- Increased AST/ALT
- Eosinophilia
- Non-immune anaphylaxis

Potentially Symptoms of Allergy

- GI symptoms
- Rash
- Cough
- Fever
- Wheezing/SOB
- Anaphylactic Shock

Potentially Symptoms of Infection

- GI symptoms
- Rash
- Cough
- Fever
- Muscle Aches
- Wheezing/SOB

Amoxicillin Rash

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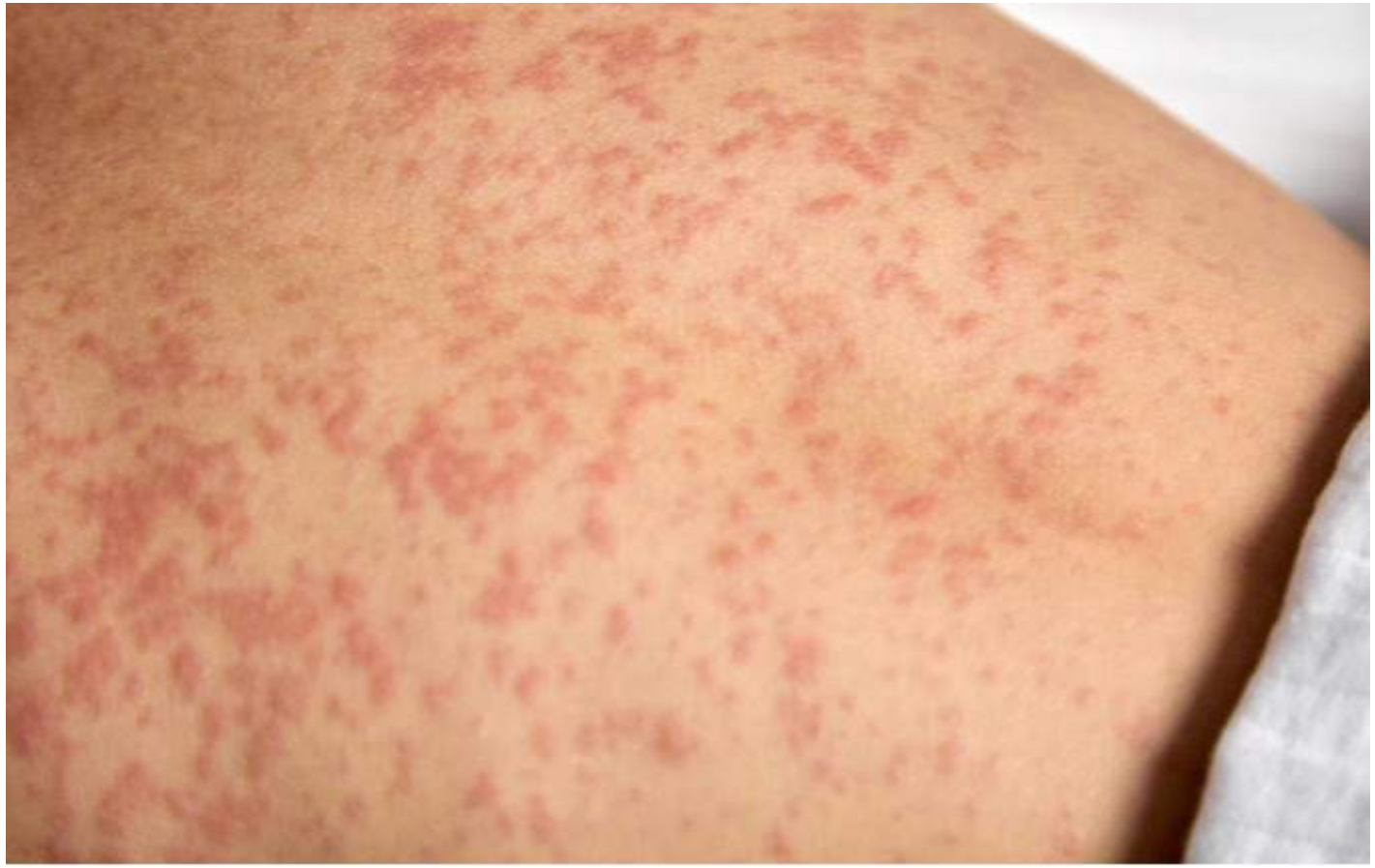
Non-Allergic Rash

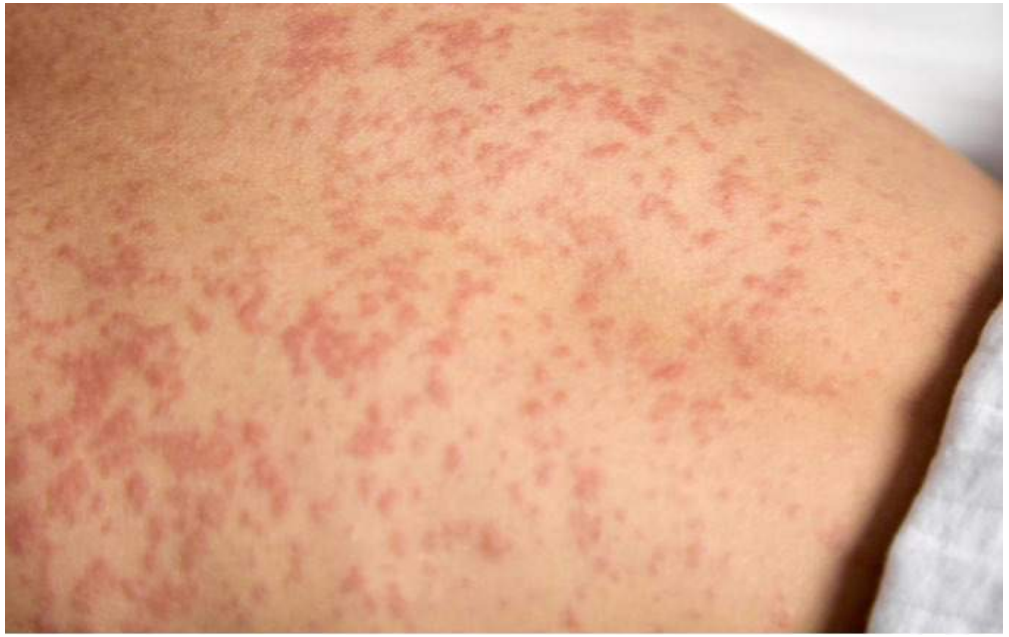
- Maculopapular rash
- Small, widespread pink spots in a symmetrical pattern
- slightly raised pink bumps
- Usually appear on day 5-7 from the start medication
  - can occur at any time
- Usually on chest, abdomen or back
- Usually involves the face, arms and legs - the rash may worsen before it gets better
- Usually goes away in three days, but can last from one to six days

Allergic Rash

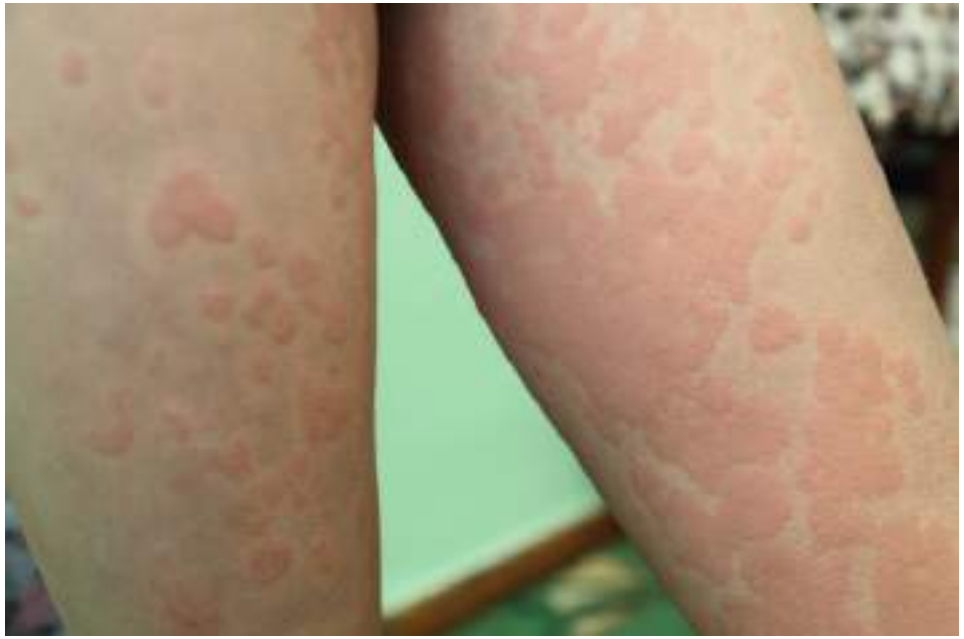
- Onset occurs within hours, rather than days, after taking the medication
- The rash is comprised of hives rather than a small rash. Hives are raised and larger than the small dots
- Allergic hive reactions itch and may even hurt – especially when touched, scratched, or when they experience pressure.
- The size, shape, and location of hives vary.



Non-Allergic Rash



Allergic Rash



What are the challenges to fitting into outpatient workflow?

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How do we identify patients?

Who screens the patients (using PENFAST)?

Is this the same person who would order oral challenge?

How long does it take?

Do we use the same protocol as inpatient?

What if there is a severe reaction?

Is this a billable visit? Does insurance pay for it?

What are the challenges to fitting into outpatient workflow?

- How do we identify patients?
- **Who screens the patients (using PENFAST)?**
  - Inpatient: pharmacist screens
  - Outpatient: ???
    - Too much subjectivity and clinical judgement for MA, LPN.
    - Could a trained nurse? Unclear
    - Would need to be a midlevel provider, pharmacist, or doctor
- **Is this the same person who would order oral challenge?**

What are the challenges to fitting into outpatient workflow?

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What are the challenges to fitting into outpatient workflow?

- How do we identify patients?
- Who screens the patients (using PENFAST)?
- Is this the same person who would order oral challenge?
- **How long does it take?**
  - We are collecting this information
  - Learning curve for all involved
  - Efficiencies?

What are the challenges to fitting into outpatient workflow?

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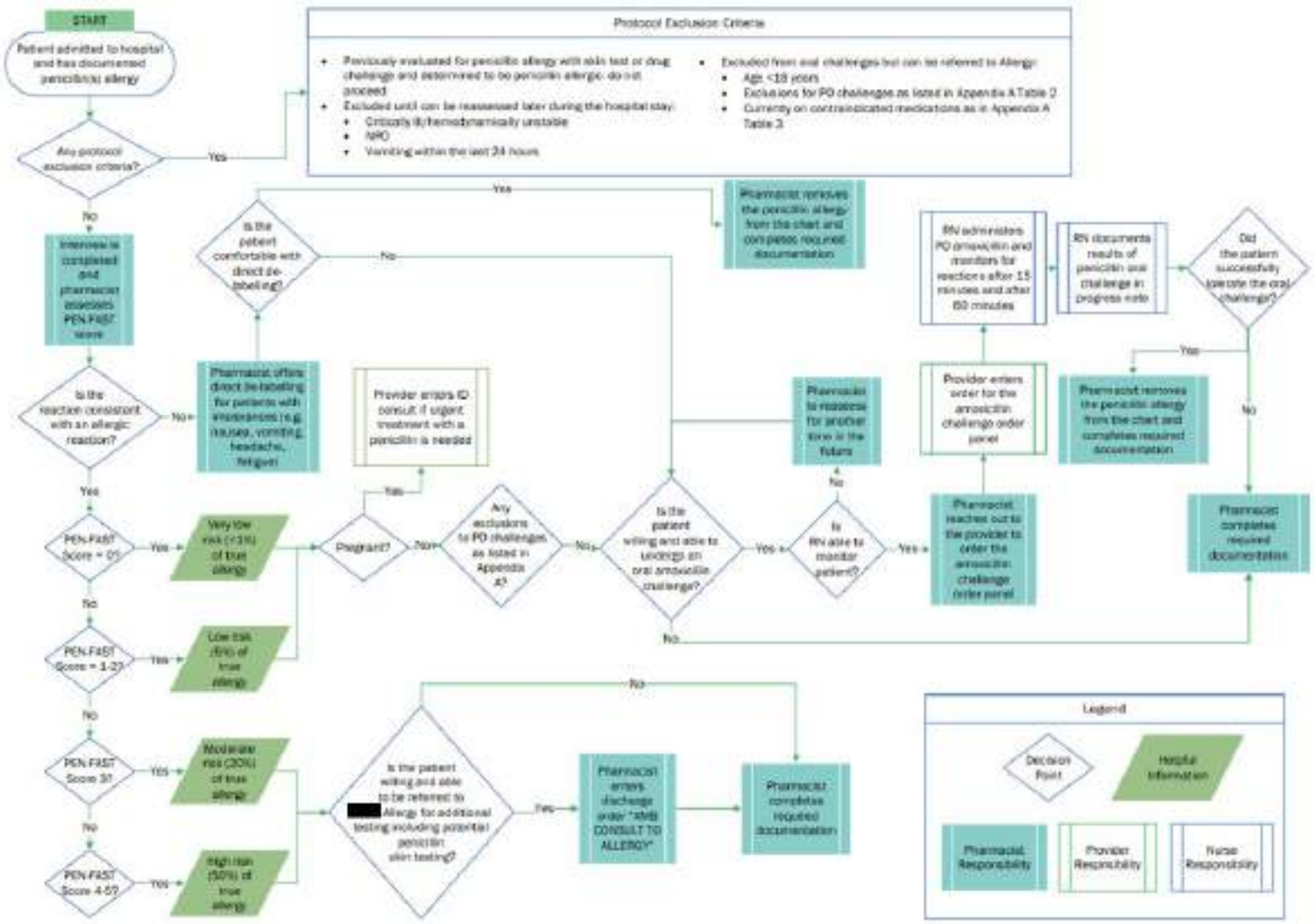
Inpatient Protocol



Already created multiple resources for pharmacy, nursing, education, tipsheets, etc

Modified/Created

- Penicillin Allergy De-labeling Nursing Tipsheet
- Clinic Workflow Outline
- Documentation / dotphrases

Completed Prior

- Patient Education Documents

METHODS

IDENTIFY

Identified patients with a penicillin label via an electronic medical record population report

PENFAST

Clinicians reached out to patients via phone or during a clinic appointment and documented a PENFAST Evaluation

ORAL AMOXICILLIN

Project tasks are performed, and the project plan is put into action.

ALLERGY REFERRAL

Progress is monitored, and any deviations from the plan are identified and addressed.

- Oral Amoxicillin Challenge Protocol:
  - 1 hour RN visit (must be completed by RN, not MA)
  - RN starts documentation using our created dotphrase
    - Oral medications are not charted on outpatient MAR, so dotphrase includes exact times administered
  - Clinic MD must be present and verbally told that the challenge is starting
    - That MD would manage a severe reaction
  - Vitals at Baseline, 15 mins, and 60 mins
  - Room door remains open, but RN is not in room entire time
  - Patient to alert RN if any reactions potentially occur, RN to triage as appropriate

- Modified to allow patients to complete during other clinic appts

What are the challenges to fitting into outpatient workflow?

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Panic!

Remember:
Anyone could have a reaction to any clinic administered medication

Allina Health Group Policy:

Anaphylaxis Management Post Immunization

Reference #: AHG-CSC-026

Origination Date: 10/2020
Revised Date: 10/2024
Next Review Date: 9/30/2025

Approval Date: 11/2024
Approved By: AHG Nurse Executive Council

Policy Owner/Ownership Group: Director of Ambulatory Nursing and Director of Pharmacy
Policy Information Resource: AHG Nursing Administration, Allergy Physician Leads, Director of Pharmacy

Medication	RN Assessment	Adult Dose	Pediatric Dose	Nursing Action / Disposition
Epinephrine	**SEVERE Symptoms:** -Difficulty breathing/ coughing or wheezing -Lip/tongue/face swelling -Full body flushing -Full body hives or itching Sudden repeated vomiting, diarrhea	**Epi-Pen IM** May be repeated every 5 min up to 2 doses (0.3 mg per inj.)	**Children less than 33 lbs. (15kg)** 0.01 mg/kg, up to max of 0.3mg (0.3ml) of 1mg/ml solution given IM or SC every 5 minutes as needed up to 2 doses **Wt. 33-66 lbs. (15-30 Kg)** Epi-Pen Junior IM (May be repeated every 5 minutes up to 2 doses) **Wt. > 66 lbs. (30 kg)** Epi-Pen IM (0.3 mg per inj) May be repeated every 5 min up to 2 doses	• Per assessment, the RN may administer the first Epinephrine dose prior to calling a clinic response • Call a clinic response • Stay with the patient and delegate appropriate care per scope • Call 911 • Vital signs are monitored q 5 minutes until EMS arrives (Blood Pressure, Pulse, Respiratory rate, O2 saturation and Respiratory status)
Oxygen	O2 Saturation <92%	5L/min face mask or 2L/min nasal cannula **ADULT with COPD** 2L/min nasal cannula 10L/min rebreathing mask	**ADOLESCENTS 12 years and older:** 5L/min face mask or 2L/min nasal cannula Children <12 years: 1L/min	• Vital signs are monitored q 5 minutes until EMS arrives (Blood Pressure, Pulse, Respiratory rate, O2 saturation and Respiratory status) • Titrate oxygen to achieve O2 saturation of 92% or higher starting at 2L/min via nasal cannula

Adjunctive Therapy				
Medication	**RN Assessment**	**Adult Dose**	**Pediatric Dose**	**Nursing Action / Disposition**
Albuterol Nebulizer or MDI (if available)	Administered for the following: • Severe bronchospasm as an adjunctive treatment • For bronchospasm not responsive to epinephrine	Premixed ampule (2.5mg/3ml) by facemask or mouthpiece or 2 puffs by metered dose inhaler	Child <15 kg (33 lbs): Half of a premixed ampule 0.083% (2.5mg/3ml) +2 ml normal saline by facemask or mouthpiece Child >15kg (33 lbs): Premixed ampule (2.5mg/3ml) by facemask or mouthpiece	• Stay with the patient and delegate appropriate care per scope • Vital signs are monitored q 5 minutes until EMS arrives (Blood Pressure, Pulse, Respiratory rate, O2 saturation and Respiratory status)
DiphenhydrAMINE (Benadryl)	For relief of urticaria and itching only. Use if needed after patient has received epinephrine.	**50 mg orally** **or** **50 mg IM** Contraindications: • Hypersensitivity to diphenhydrAMINE and other similar antihistamines • Nursing mothers	**Up to 6 years** 12.5mg orally or IM **6-12 years** 25mg orally or IM Contraindications: • Hypersensitivity to diphenhydrAMINE and other similar antihistamines	• Stay with the patient and delegate appropriate care per scope • Vital signs are monitored q 5 minutes until EMS arrives (Blood Pressure, Pulse, Respiratory rate, O2 saturation and Respiratory status)

What are the challenges to fitting into outpatient workflow?

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How do we identify patients?

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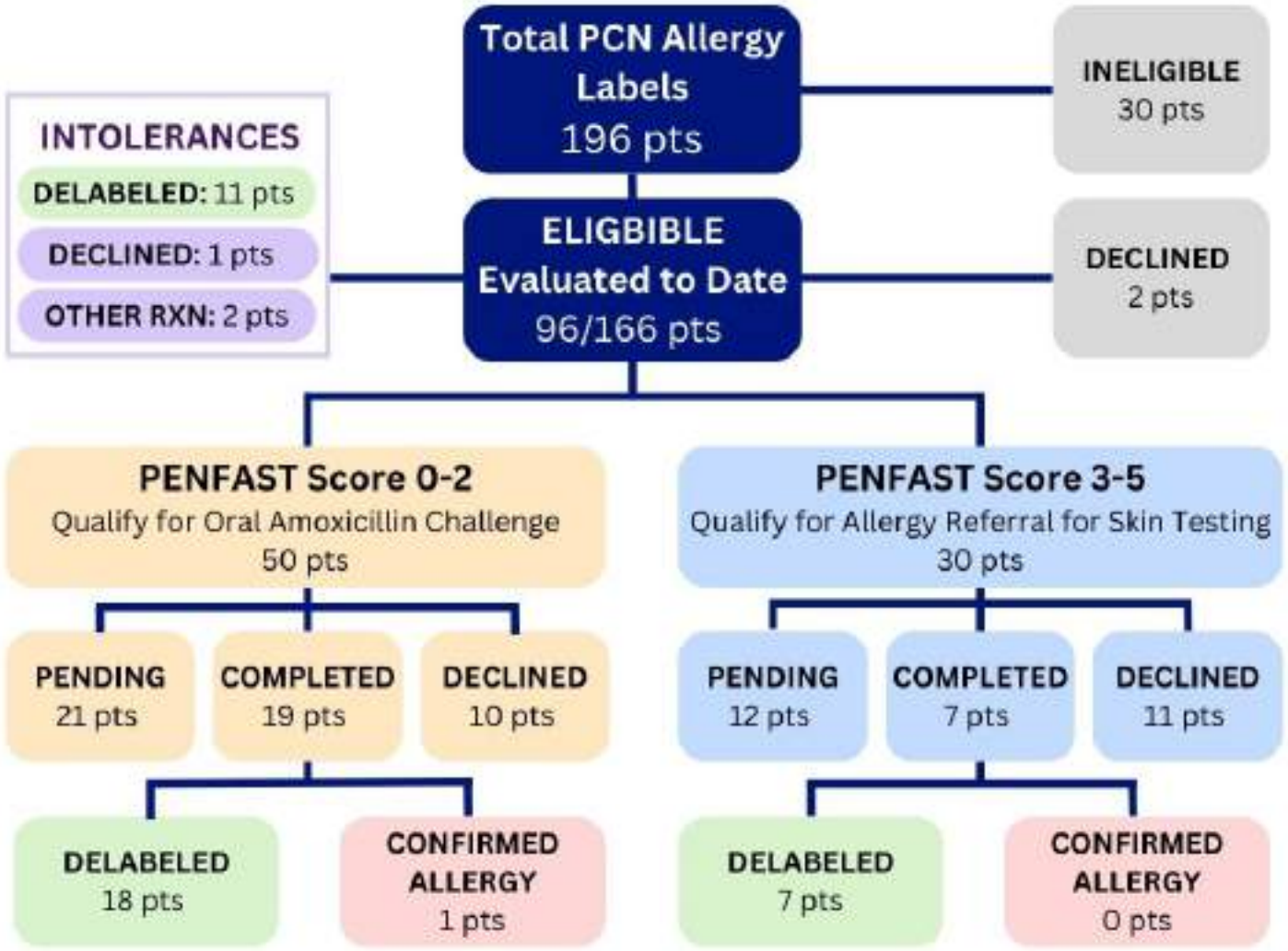
What if there is a severe reaction?

Is this a billable visit? Does insurance pay for it?

- **Is this a billable visit? Does insurance pay for it?**
  - As a QI project, we have not been billing for amoxicillin oral challenge visits
    - RN visit – not billing
  - Add on during a scheduled office visit – the office visit is billed as normal
  - Cannot bill oral medications
    - Amoxicillin capsules cost literally pennies


Total PCN Allergy Labels
196 pts
INELIGIBLE
30 pts
INTOLERANCES
DELABELED: 11 pts
DECLINED: 1 pts
OTHER RXN: 2 pts
ELIGBIBLE Evaluated to Date
96/166 pts
DECLINED
2 pts
PENFAST Score 0-2
Qualify for Oral Amoxicillin Challenge
50 pts
PENFAST Score 3-5
Qualify for Allergy Referral for Skin Testing
30 pts
PENDING
21 pts
COMPLETED
19 pts
DECLINED
10 pts
PENDING
12 pts
COMPLETED
7 pts
DECLINED
11 pts
DELABELED
18 pts
CONFIRMED ALLERGY
1 pts
DELABELED
7 pts
CONFIRMED ALLERGY
0 pts

Further Steps

1. Complete the last 70 patients
2. Compare time
    1. Explore efficiencies in workflows
3. Review why patients decline
    1. Cost?
    2. Mistrust?
    3. Time?

Challenges Identified

1. Fluidity of outpatient appts
   - many are changed, moved, scheduled, canceled, etc.
   - Makes working ahead very challenging
2. Answering, “Why now”
   - During inpatient, there is already an infection or serious issue
   - Outpatient, very easy to say, “Not today”
3. Clinical judgement when using PEN-FAST
   - Scoring requires some subjectivity, would not be within scope for MA or LPN, and probably not standard clinic RN
4. Fitting into a busy clinic visit

Potential Pathways Forward

1. Add to Pre-op visit
    1. Provider does PENFAST score?
    2. Provider just asks about allergy and delabels clear non-allergies, then refers to centralized group?
2. Send detailed MyChart Survey
    1. The ones answering will be most likely to follow up – they are engaged
    2. Routes to PCP or some primary group?
3. Set up oral challenge clinics
    1. How many?

Questions?

PENICILLIN DE-LABELING and ORAL AMOXICILLIN CHALLENGE CASES

Michele D. Granada, MD, FACP, FIDSA

Allina Health Infectious Diseases – Abbott Northwestern Hospital

Infectious Diseases - ANGMA

Allina Health

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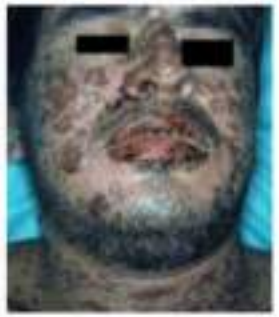
PEN-FAST SCORE

- **A PEN-FAST score of 0 indicates very low risk (<1%) of true penicillin allergy**
- **A PEN-FAST score of 1-2 indicates low risk (5%) of true penicillin allergy**
- **A PEN-FAST score of 3 indicates moderate risk (20%) of true penicillin allergy**
- **A PEN-FAST score of 4-5 indicates high risk (50%) of true penicillin allergy**

Criteria	Score
Five years or less since reaction¥	2 points
Anaphylaxis/angioedema OR Severe cutaneous adverse reaction*	2 points
Treatment required for reaction	1 point

- ¥Or unknown
- *Severe cutaneous adverse reaction (SCAR) includes Stevens-Johnson Syndrome (SJS), toxic epidermal necrolysis (TEN), and drug reaction with eosinophilia and systemic symptoms (DRESS). Note: patients with severe delayed rash with mucosal or ocular involvement should be considered to have a SCAR. Reactions such as acute interstitial nephritis, drug induced liver injury, serum sickness, and isolated drug fever were also excluded phenotypes from the derivation and validation cohorts of the PEN-FAST scoring tool and are excluded from oral amoxicillin challenges as described in Appendix A Table 2.

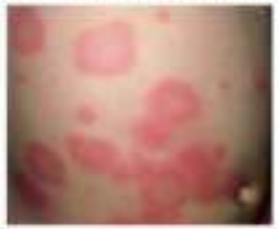
NOT ALL RASHES ARE EQUAL



What?
- Skin peeling or blistering
- Mucosal (eyes, mouth, genital) involvement

When?
- After several days of drug administration
- Patient requires hospitalization

This is:
Exfoliative dermatitis
= SEVERE skin reaction



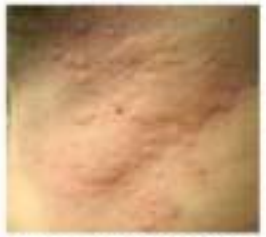
What?
- "Bull's-eye" target-shaped rings

When?
- After 2—3 days of drug administration

This is:
Erythema multiforme
= SEVERE skin reaction

Not appropriate for oral challenge, regardless of risk score

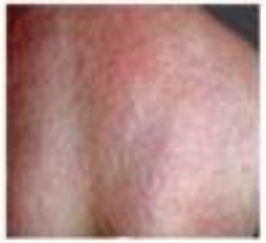
Appropriate for oral challenge with low-risk score



What?
- Itchy welts (red bumps with white centers, look like early mosquito bites)
- Can be single or multiple

When?
- Within 6 hours of drug administration
- Bumps disappear after a few hours and new ones may develop

This is:
Hives *(urticaria)*
= MODERATE skin reaction



What?
- Red dots covering a large area of the body
- May feel like sandpaper to the touch
- Usually on the trunk, arms, legs

When?
- After 2-3 days of drug administration
- *Most common type of drug rash*

This is:
Non-urticarial rash
= MILD skin reaction

DEVELOPED BY THE JOHNS HOPKINS HOSPITAL
DEPARTMENT OF ANTIMICROBIAL STEWARDSHIP

NURSE ANTIBIOTIC STEWARD

JOHNS HOPKINS MEDICINE

GUIDED PATIENT CONVERSATION FOR ORAL AMOXICILLIN CHALLENGES

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The following are examples of bullet point language to use when talking to patients about oral amoxicillin challenges

- This is an elective procedure, and it is completely your choice whether or not to do this.
- The most recent allergy science shows that 10% of penicillin allergy patients will lose a penicillin allergy every year, and that almost all patients will grow out of a penicillin allergy by 10 years following a reaction.
- In many cases, the symptoms that may have been referred to as penicillin allergy were never really an allergy to begin with. This includes things like stomach symptoms, or someone else in the family having an allergy.
- Childhood rashes while on penicillin are also very unlikely to be penicillin allergy in adulthood.
- Using details from your history, we found that your penicillin allergy is very low risk for an ongoing allergy, which means that there is a less than 5% chance that you would have a positive penicillin allergy test in an allergy clinic.

GUIDED PATIENT CONVERSATION FOR ORAL AMOXICILLIN CHALLENGES

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- Having a penicillin allergy in your chart past the point of needing it is associated with many bad outcomes to a person's health, including worse outcomes from infections, more antibiotic side effects, and an increased chance of drug resistant infections.

- Therefore, we would like to give you a single dose of amoxicillin while you are already in the hospital to test for a penicillin allergy so we can clarify your records and help us to best treat you with antibiotics in the future.

- **Would you be willing to take this dose?** It would mean that we could remove your penicillin allergy from your chart. That way, the next time you need treatment for an infection, we would already know that penicillins are safe for you to take.

- Again, this is an elective procedure, and it is completely your choice whether or not to do this.

GUIDED PATIENT CONVERSATION FOR ORAL AMOXICILLIN CHALLENGES

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- Additional questions that patients might have, with answers:

How does the procedure work?

- A single dose of amoxicillin would be given to you by mouth, and we would monitor you with more frequent vital signs for the following hour. After that time, if you haven't had any major symptoms, we will know that your risk of having an immediate or life-threatening reaction to penicillin in the future is very low and the allergy can be removed from your records.

Will I never have a reaction to penicillin again in the future?

- 2-5% of people may still have a mild delayed rashes at any time during future treatments with penicillin. These rashes are generally considered a nuisance in comparison with being able to take the right antibiotics for an infection.

CASE # 1 – Syphilis in Pregnancy

- 32 y/o at 19 weeks AOG who was referred for positive RPR 1:64.
- Hx of chlamydia 8 years ago. She never had syphilis in the past. She has no history of cold sores or genital herpes.
- She only has 1 male partner, and last oral sex was 1 week prior. Their relationship has been on and off for the past 10 years. She says that he has been unfaithful to her in the past.
- Several days later: subjective fevers, night sweats and sore throat, enlarged cervical lymph nodes. Denies blurring of vision, decreased hearing, headache, neck pain or stiffness. No rash. No vulvar or vaginal lesions or ulcers or discharge.

CASE# 1 – Syphilis in Pregnancy

- Saw her PCP on 11/7/22: given azithromycin with no relief of symptoms. HIV Ab screen non-reactive and T. pallidum reactive with RPR of 1:64. Last syphilis testing non-reactive in July 2022.
- Referred to ID-ANGMA on 11/15/22
- This was before we had the protocol for penicillin de-labeling
- I sent a script of amoxicillin 250 mg x 1 dose to the Heart pharmacy and then had my MA pick it up there

CASE # 1 – Syphilis in Pregnancy

- Penicillin and amoxicillin – rash and hives at age of 7, tolerated cephalosporins
- PEN-FAST score 1, low risk (5%) of true penicillin allergy
- Tolerated oral amoxicillin challenge done at ID-ANGMA clinic on 11/15/22
- Treated with benzathine penicillin 2.4 million units IM, 1st dose given on initial visit.
- It took more than 2 hours, almost 3 hours to complete.

CASE # 2 – Granulomatous Mastitis

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50 y/o F with type 2 DM

- 1 year history of purulent right nipple discharge

- 6.27.24 - right breast pain with palpable lump and overlying erythema

  Right breast US: irregular, hypoechoic area measuring 3.1 x 3.0 x 2.9 cm

  Given 1 dose of IV vancomycin in ED then discharged on bactrim 

CASE # 2 – Granulomatous Mastitis

- 7.3.24 - repeat breast US: mass versus two adjacent abutting masses in the RIGHT breast at 9 o'clock with associated nipple retraction

  Aspiration of purulent debris and biopsy done

  Culture: 3+ Corynebacterium kroppenstedtti

  Pathology: Cystic neutrophilic granulomatous mastitis

- 7.10.24 - saw Derm for initiation of intralesional steroids injections

  Treated with doxycycline x 14 days

CASE # 2 – Granulomatous Mastitis

- 8.14.25 - increased pain, redness overlying areas of right breast and intralesional steroid injections with some fluctuance

US-guided right breast aspiration: targeted to the 9 o'clock position 1 cm from the nipple shows a superficial complex fluid collection measuring 4.7 x 3.7 x 1.7 cm. This is contiguous with a fluid collection within breast tissue at 9 o'clock 4 cm from the nipple.

- Breast Surgery discussed with me and I recommended sending sample for routine bacterial cultures, AFB culture and 16s rDNA PCR

CASE # 2 – Granulomatous Mastitis

- 8.17.24 - aerobic culture: 2+ Corynebacterium kroppenstedtii S ceftriaxone, meropenem and vancomycin, I to penicillin

  Continued doxycycline 100 mg po BID 

- 9.27.24 - increased pain, swelling, erythema left breast

  US-guided aspiration

  Cultures: corynebacterium and actinomyces sp.

- Added cefdinir 300 mg po BID to doxycycline 

- Plan minimum of 6 months duration for granulomatous mastitis

CASE # 2 – Granulomatous Mastitis

- Remote history of penicillin allergy during childhood
  - Rash
  - No anaphylaxis
  - No SCAR

PEN-FAST score 0, with very low risk (<1%) of true penicillin allergy

Tolerated oral amoxicillin challenge at ID-ANGMA clinic on 11/7/24.
It took only 1 hour since we had the protocol in place.

Continued doxycycline for the corynebacterium and added amoxicillin for the actinomyces and treated for 6 months

CASE # 3 – Surgical Site Infection

- 43 y/o F with Tetralogy of Fallot with initial repair in 1982 and pulmonary valve homograft in 1985, Obesity and OSA

3.19.25 - RHC, pulmonary artery angiogram, selective left coronary angiogram, successful transfemoral transcatheter PV replacement with 23mm Edwards Sapien 3 Ultra Resilia valve for severe pulmonic stenosis and pulmonary artery coil embolization

After valve deployment, sustained guidewire perforation of left pulmonary artery

Developed pulmonary hypoxia and shock

3.19-4.3.25 - transferred to ANW from Mercy for cardiogenic shock, HIT, bilateral PE and DVT

CASE # 3 – Surgical Site Infection

3.21.25 - Procedure: 1. Left common femoral artery exposure 2. Removal of the left external iliac artery ECMO cannula 3. Removal of the left superficial femoral artery distal perfusion catheter 4. Removal of the venous ECMO cannula and primary repair

3.22.25 - bronchoscopy for hemoptysis and concern for airway obstruction

Findings: left mainstem mobile thrombus

3.26.25 - CTA AP: right common femoral artery pseudoaneurysm

Procedure: Right common femoral artery exposure. Primary repair of right common femoral artery pseudoaneurysm

Findings: There was a large pseudoaneurysm with a large hematoma which was excised and the artery repaired primarily with good flow proximally and distally

CASE # 3 – Surgical Site infection

3.29.25 - low platelets, positive HIT

CT chest PE: bilateral PE

Doppler US: right common femoral DVT

- Since hospital discharge, there has been increased serous drainage on right groin incision

4.11.25 - seen by HHC and bilateral femoral incisions dehisced with slough, increased drainage malodorous and purulence

sent to ED

- 4/11/25 wound culture: 4+ mixed flora

CASE # 3 – Surgical Site Infection

- CTA AP: no groin hematoma, no arterial pseudoaneurysm or AV fistula; small seroma or hematoma left groin; right groin with more pronounced inflammation, fluid, SQ emphysema but no abscess

- 4.12.25 - Procedures: 1. Incision and drainage of right groin abscess. 2. Sharp excisional debridement of skin, subcutaneous tissues from bilateral groins. 3. Wound VAC placement bilaterally.

  Findings: purulent fluid in subcutaneous space on right and after draining abscess, there was necrotic tissue but deep tissue covering femoral artery is intact; on the left, there is dehisced wound with some necrotic tissue at skin and subcutaneous tissue

  Surgical cultures: 4+ ESBL E. coli, 1+ mixed GI flora

- Discharged on IV ertapenem

CASE # 3 – Surgical Site Infection

- Remote Hx of penicillin allergy during childhood (hives)
- PEN-FAST score 0-1 with low risk (1-5%) of true penicillin allergy
- Reviewed meds: famotidine [had not taken since last hospital discharge] and hydroxyzine [last dose on 4/11/25 2232]
- Instructed not to take H1 and H2 blockers and hydroxyzine and will do the oral amoxicillin challenge during her follow-up in the office.
- ID follow-up on 5/1/25 and tolerated oral amoxicillin challenge. Since protocol was in place, completed in 1 hour

CASE # 4 – Chronic Empyema vs Pneumonia

69 y/o M with severe COPD, spontaneous pneumothorax, recurrent empyema

2022

10.20 - ROBOTIC XI-ASSISTED REPAIR OF LEFT LUNG AIR LEAK WITH PARIETAL PLEURAL FLAP; DRAINAGE OF POSSIBLE EARLY EMPYEMA

12.10 - readmitted for recurrent empyema and had bronchopleural fistula

12.14 - Left chest tube placement

pleural fungal culture: aspergillus fumigatus complex

CASE # 4 – Chronic Empyema vs Pneumonia

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2023

6.30 - admitted for empyema

thoracentesis: purulent fluid

Pleural fluid culture: pseudomonas aeruginosa

treated with cefepime

8.17 - completed 8 months of voriconazole

2025

1 week PTA – productive cough, dyspnea on exertion

Took cefdinir prescribed by his Pulmonologist

CASE # 4 – Chronic empyema vs Pneumonia

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9.17 - Fever Tm 101.4 F, chills, nasal congestion

COVID/FLU/RSV panel

CTA chest: Loculated appearing moderate left hydropneumothorax, could be chronic

Transferred to ANW for Thoracic surgery management

Started on cefepime

Multiple antibiotic allergies

- FQ – rash
- Sulfa – unknown
- Penicillin – rash, no anaphylaxis, unsure when this occurred

CASE # 4 – Chronic empyema vs Pneumonia

- PEN-FAST score 2 with low risk (5%) of a true penicillin allergy
- Tolerated oral amoxicillin challenge on 9/19/25
- On 9/20/25, hospitalist told me that he had some rash on his back
- I went to patient's room and examined him. Rash on his back was not pruritic and is c/w dermatitis, which patient thought was from the bed sheet. I reassured patient that's it's not a failed challenge.
- Discharged on augmentin x 7 days for pneumonia

CASE # 5 – Right Chest Wall Cellulitis

44 y/o F with right inflammatory breast cancer s/p neoadjuvant chemotherapy

5.7.25 - laparoscopic RIGHT oophorectomy and RIGHT mastectomy with completion RIGHT axillary lymph node dissection

Two-JP surgical drains were positioned in the RIGHT mastectomy and RIGHT axillary surgical cavities prior to primary closure of surgical site.

5.27.25 - last drain removed then had fever (Tm 102 F) and chills, poor appetite, malaise

CASE # 5 – Right Chest Wall Cellulitis

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5.29.25 - redness and induration extending from drain area and incision site on right side

went to clinic and US showed small seroma

aspiration of seroma sent for cultures

admitted to ANW

5/29/25 Right chest wall aspirate culture: NG

MRSA PCR negative

16s rDNA PCR pending

CASE # 5 – Right Chest Wall Cellulitis

- Remote Hx of penicillin allergy
  - Occurred 17 years ago and had hives
  - No anaphylaxis
  - No SCAR
  - Took benadryl
- PEN-FAST score 1, low risk (1-5%) of a true penicillin allergy
- Last claritin use 7 days PTA
- Agreed to oral amoxicillin challenge on 5/31/25. But she had some pruritus over right chest wall area, so she wanted to wait before doing the challenge

CASE # 5 – Right Chest Wall Cellulitis

- Tolerated oral amoxicillin challenge on 6/3/25
- 2 hours after the oral amoxicillin challenge, RN tells me she has papules on chest but not pruritic and not erythematous
- I immediately went to see patient and I only saw papules. I reassured patient that the papules are not c/w failed challenge.
- I went back again after 1 hour and there were no new lesions. Patient states that she might have had the papules the day prior

CASE # 5 – Right Chest Wall Cellulitis

She also had purulent drainage from right chest wall incision but no cultures were sent

- Discharged her on augmentin + doxycycline
- I gave her my card and told her to call me if she develops any rash after hospital discharge
- The 16s rDNA PCR came back negative and I sent her a MyChart message. Then she replied saying she has no rash and tolerating augmentin and she was so glad that we did the challenge

CASE # 6 – Intra-abdominal Abscess, Bacteremia, Infected Thrombus

72 y/o F with HTN, HLD, DVT, Anemia

6.3.25 - Open Whipple procedure, en bloc SMV with jejunal and ileal vein resection, jejunal ileal branch primary venoplasty and primary end to end Jejunal-ileal to SMV anastomosis, and open primary repair of umbilical hernia

Pathology: poorly differentiated pancreatic ductal adenocarcinoma

6.22.25 - abdominal pain, chills, rigors, fever Tm 102 F

CT CAP: intra-abdominal fluid collections along the left lobe of the liver with foci of air tracking to the region of the jejunostomy as well as foci of pneumoperitoneum at the surgical site

CASE # 6 - Intra-abdominal Abscess, Bacteremia, Infected Thrombus

- Started on ceftriaxone and metronidazole
- Transferred to ANW ICU for septic shock and antibiotics changed to meropenem

- Remote history of penicillin allergy
  - Hives during childhood
  - No anaphylaxis
  - No SCAR
  - ?required treatment

  PEN-FAST score 0-1 with low risk (1-5%) of a true penicillin allergy

CASE # 6 - Intra-abdominal Abscess, Bacteremia, Infected Thrombus

- I initially discussed oral amoxicilin challenge and planned to do this when she is hemodynamically stable

- Patient initially was hesistant but then agreed but wanted opinion from her daughters who are RNs so when she asked for their opinion while I was there, they both said that she should agree with my recommendations

- 6.24.25 - CT-guided aspiration and drainage with small hematoma and complete collection aspirated

  Aspirate cultures: NG.

  16s rDNA PCR pending

- Tolerated oral amoxicillin challenge on 6/27/25. Meropenem was stopped as all cultures negative

CASE # 6 - Intra-abdominal Abscess, Bacteremia, Infected Thrombus

- 7.8.25 - readmitted to ANW ICU for septic shock, started on zosyn
- CT AP: Severe narrowing of the portal vein present near its confluence with the superior mesenteric vein. To the right of this confluence is a branch of the SMV that is thrombosed as it approaches this narrowed segment. A small amount of gas is present near the pancreaticoduodenal anastomosis, similar to prior exam.
- 6/24/25 16s rDNA PCR aspirate: lactobacillus gasseri
- Blood cultures: streptococcus sp.
  - Possible sources: oropharyngeal, infected portal vein or SMV thrombus, GI translocation

CASE # 6 - Intra-abdominal Abscess, Bacteremia, Infected Thrombus

- Switched zosyn to unasyn
- Blood cultures: Streptococcus mitis PCN MIC <=0.06
- Switched unasyn to penicillin G 24 million units IV daily as continuous infusion for 6 weeks to cover both strep mitis and lactobacillus, treating infected portal vein or SMV thrombus

CASE # 7 – Diabetic Foot Infection

77 y/o M with Type 2 DM, PAD, HFpEF, CAD, pancreatic cyst lesion

3.13.25 - ischemic left foot ulcer

4.17.25 - worsening pain so went to ED

Diagnosed with cellulitis and treated with clindamycin

4.19.25 - worsening symptoms so admitted to ANW

CRP 6

Xray: mild soft tissue swelling dorsal aspect forefoot

Started on ceftriaxone

CASE # 7 – Diabetic Foot Infection

- 4.24.25 - Left common femoral and superficial femoral artery endarterectomy with bovine pericardium patch

- 4.25.25 - LEFT 5TH METATARSAL HEAD EXCISION Findings: Soft bone of the distal 5th metatarsal head plantar region. Hard bone at the resection margin, sent to pathology. 5th digit proximal phalanx was hard, appeared uninvolved. No purulence or ascending infection. Plantar wound 3:1 elliptial closure and primary closure of dorsal incision. Good bleeding to bone, deep tissue and skin.

- wound culture: ampicillin-S Enterococcus faecalis and methicillin susceptible staph lugdunensis

CASE # 7 – Diabetic Foot Infection

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Mulitple antibiotic allergies

- Cefazolin – 10 years ago, rash
- Penicillin - >25 years ago, rash/hives, no anaphylaxis, no SCAR, took benadryl

- PEN-FAST score 1, low risk (5%) of a true penicillin allergy

- Tolerated oral amoxicillin challenge 4/26/25

- Discharged on 4/27/25 on augmentin 875 mg po BID x 7 days

CASE # 8 – Prosthetic MV Infective Endocarditis

71 y/o M with

- HALT s/p bioprosthetic MVR 11/18/22
- HOCM s/p ventricular septal myomectomy
- CHB s/p PPM
- Paroxysmal AFib s/p LAA ligation
- CAD s/p CABG
- Hx of ureteral stones, BPH

April 2025 – hematuria for 2-3 weeks

- saw his Urologist
- UA: large blood, negative nitrite,WBC 25
- Rx Ciprofloxacin 

CASE # 8 - Prosthetic MV Infective Endocarditis

5.3-5.5.25 - admitted to OSH for slurred speech after driving his car into a ditch

Brain MRI: subacute infarcts and diffuse parenchymal atrophy

2D echo: concern for MV obstruction vs thrombus

5.5.25 - transferred to ANW

5.8.25 - 2D echo: MV bioprosthesis with valve obstruction/thrombosis, gradient across the MV has increased significantly, no MR.

5.9.25 - CT cardiac morphology: Very abnormal #33 Epic MVR highly suggestive of endocarditis (independent motion with thickened and irregular low attenuation material with decreased leaflet opening).

CASE # 8 - Prosthetic MV Infective Endocarditis

- 5.9.25 ID consult: Subactue ischemic infarcts likely cardio-embolic with abnormal CT cardiac morphology, concerning for prosthetic MV infective endocarditis
  - Ordered blood cultures first before starting antibiotics
  - Ordered TEE: MV prosthesis obstructed, leaflets diffusely thickened, 1.2 cm mobile echodensity on atrial aspect of MV, no MR, filamentous mobile echodensity on device lead
  - Ordered PET CT: Nearly circumferential uptake along the margins of a bioprosthetic mitral valve replacement; indeterminate findings on the spine and lumbar fusion.

CASE # 8 - Prosthetic MV Infective Endocarditis

- Blood cultures: Enterococcus faecalis S ampicillin, penicillin, gentamicin
- Started on IV vancomycin and IV gentamicin with pharmacy dosing

- Positive blood cultures 5/9, 5/10, 5/11
- Negative blood cultures 5/13, 5/14, 5/15, 5/16

- History of penicillin allergy
- Listed as hives

- I was unable to get any further history as he was encephalopathic from the CVA

CASE # 8 - Prosthetic MV Infective Endocarditis

- Eventually on 5/15/25 ~ day 6 of admission, patient was more awake and alert and I was able to confirm his penicilin allergy

- Remote history of penicillin allergy
  - Rash 20 years ago
  - No anaphylaxis
  - Unsure if received treatment

- PEN-FAST score 1, low risk (5%) of a true penicillin allergy

- Tolerated oral amoxicillin challenge on 5/15/25

CASE # 8 - Prosthetic MV Infective Endocarditis

- 5.15.25 - switched vancomyin + gentamicin to ampicillin 2 g/IV q4h and ceftriaxone 2 g/IV q12h
- 5.25.25 - REDO STERNOTOMY, MITRAL VALVE REPLACEMENT WITH 33MM EPIC PLUS TISSUE VALVE, INFECTED EPICARDIAL LEADS AND PACEMAKER GENERATOR EXTRACTION, RIGHT VENTRICLE EPICARDIAL LEAD PLACEMENT, PLACEMENT OF TEMPORARY ATRIAL AND VENTRICULAR PACING WIRES, REDO STERNOTOMY, REMOVAL EPICARDIAL PACEMAKER LEADS
- MV tissue culture: Enterococcus faecalis
- Treated with 6 weeks of ampicillin + ceftriaxone through 7/3/25

CASE # 9 – MSSA Native MV Infective Endocarditis

76 y/o F with type 2 DM, HTN, OSA

10.19.24 - fall x 2, generalized weakness, fever Tm 102.5 F

LABS: WBC 21.7, CRP 30.6

Blood cultures: MSSA

Pertinent Exam: (+) holosystolic murmur apex

0.6 x 0.5 cm sacral decubitus ulcer

Cervical and Lumar spine fusion

Bilateral THA and TKA

CASE # 9 - MSSA Native MV Infective Endocarditis

Work-up:

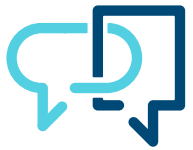
TEE: extensive endocarditis involving MV with large/bulky vegetations on both anterior and posterior leaflets and perforated posterior leaflet with severe MR, posterior leaflet abscess

MRI C/T/L-spine: no discitis/vertebral osteomyelitis/epidural abscess

- Amoxicillin allergy – rash unsure about lip swelling >20 years ago
- PEN-FAST score 2 with low risk (5%) of a true penicillin allergy

- Tolerated oral amoxicillin challenge on 10/25/24. On further review of documentation and found out that RN gave benadryl with amoxicllin so likely false negative result

CASE # 9 - MSSA Native MV Infective Endocarditis

- I educated the RN about this 
- Since I had this expericence, everytime I do an oral amoxicillin challenge, I make it a point that I talk to the RN in person and tell the steps of the procedure and then reminding them that the meds are prn and should not be given with the amoxicillin
- I have not had any issues so far.
- Extra or additional time for education is worth the effort

CASE # 10 – Recurrent LUE Cellulitis

81 yo F with

- Metastatic breast cancer to bone
- Type 2 DM
- HTN
- PE
- LUE lymphedema
- Recurrent LUE cellulitis

5.3-5.6.25 - admitted to ANW for sepsis due to LUE cellulitis

- Treated with cefazolin then discharged on cephalexin

5.13.25 - blister on LUE then had increased swelling and pain

- Rx cephalexin x 7 days

CASE # 10 – Recurrent LUE Cellulitis

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5.31-6.4.25 - admitted to ANW for auricular cellulitis AU (AS>AD)

MRSA PCR negative

Treated with cefazolin and discharged on cephalexin

5 episodes of cellulitis over past 1 year

Risk factor: lymphedema LUE and not compliant with arm sleeve, eczema

*candidate for antibiotic prophylaxis for recurrent LUE cellulitis due to lymphedema

I placed her initially on cephalexin 500 mg po BID for prophylaxis

CASE # 10 – Recurrent LUE Cellulitis

- Remote Hx of penicillin allergy 40 years ago
  - Angioedema but no anaphylaxis, no SCAR, received treatment
- PEN-FAST score of 3 with moderate risk (20%) of a true penicillin allergy
- Referred to Dermatology: uncontrolled chronic eczema and started on mometasone ointment.
- Referred to Allergy: penicillin skin testing negative and tolerated oral amoxicillin challenge on 9/2/25
- During follow with me on 9/10/25, I switched cephalexin to amoxicillin 500 mg po BID for prophylaxis

THANK YOU

Antimicrobial Stewardship | SUMMIT

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