HENRY FORD HEALTH

HENRY FORD HEALTH + MICHIGAN STATE UNIVERSITY Health Sciences

International Vaccine Institute

Integrated Activity and Tools for Antimicrobial Stewardship, Infection Prevention & diagnostic Stewardship

Breakout Session: Case Based Antimicrobial Stewardship Session

CAPTURA
Capturing data on Antimicrobial resistance Patterns and Trends in Use in Regions of Asia

TACE ASIA
Technical Assistance for Clinical Engagement

MOTT MACDONALD

UKaid from the British people

The Fleming Fund Regional Grants

Putting It All Together: Stewardship Cases

Case #1

Case #1

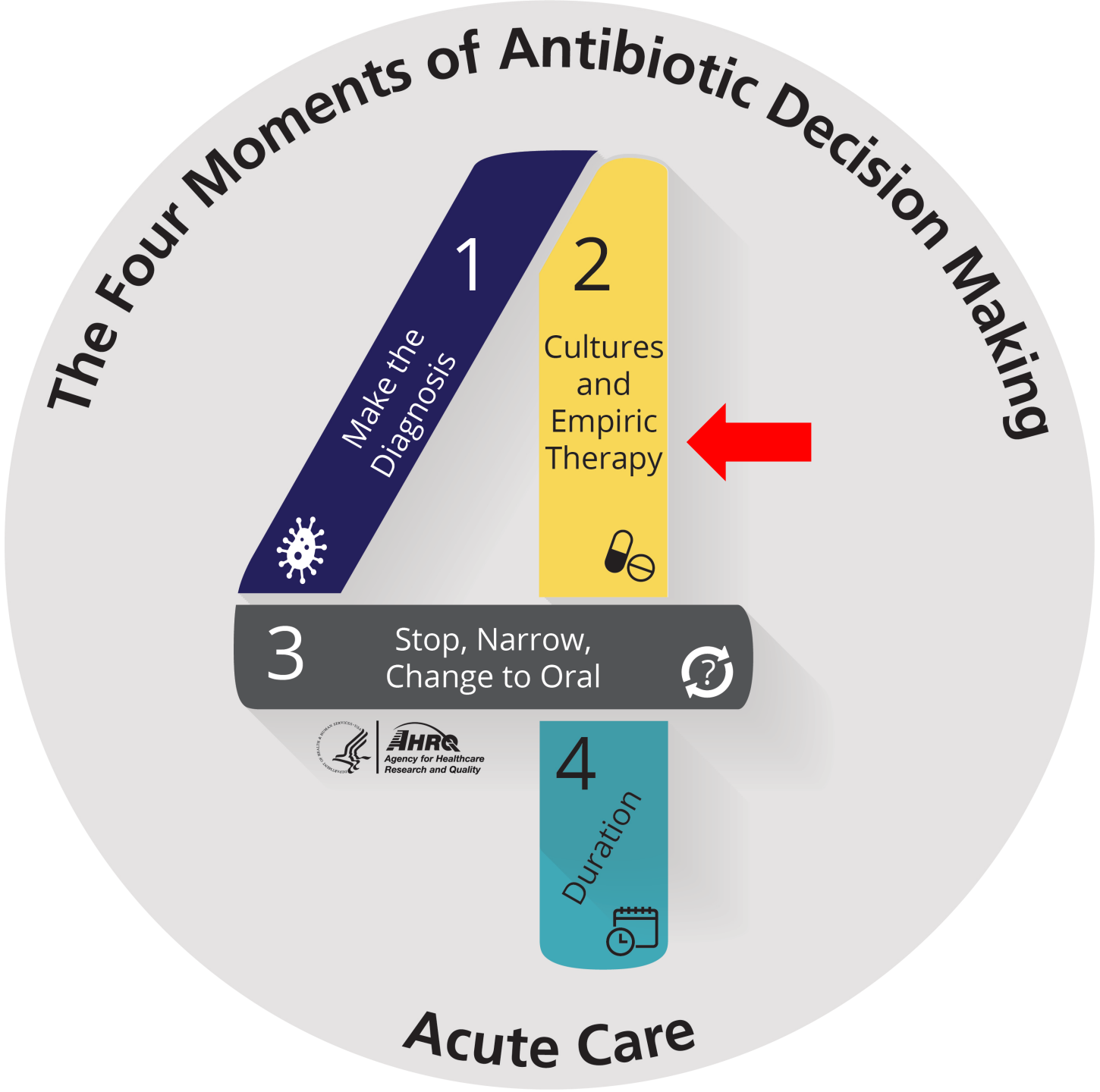
- A 72-year-old woman was admitted to the general floor with productive cough, pleuritic chest pain, fever, and confusion for the last 3 days. She was initially admitted 5 days ago for management of new onset atrial fibrillation with heart failure.

- Vitals: T 38.7, HR 108, RR 22, BP 132/83, O2 sats 95% on room air
- Labs: Elevated WBC count with acute kidney injury
- Micro: Blood and respiratory cultures are obtained prior to initiation of antibiotics.
- Radiology: Right sided pneumonia with mild effusion, no volume overload.

Case #1 Continued

- Does this patient need to be hospitalized?

- What initial therapy would you recommend?
  - Intravenous or oral?
  - What would you be cautious about with regards to dosing?



Four Moments of Antibiotic Decision Making. Content last reviewed November 2019. Agency for Healthcare Research and Quality, Rockville, MD.

Antibiotic Renal Dosing

- How are antibiotics usually dosed?

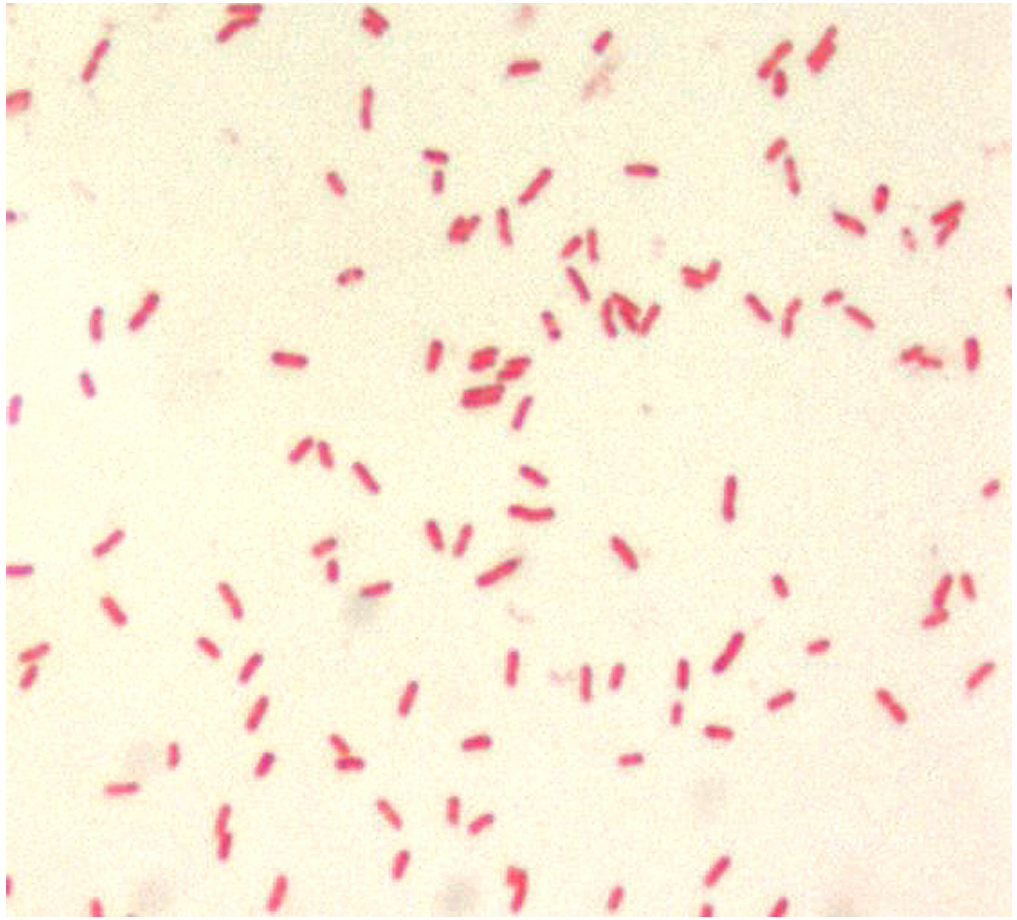
Cockcroft-Gault Formula for Estimating Creatinine Clearance

$$\text{CrCl (mL/min)} = \frac{(140\text{-age}) \times \text{Lean Body Weight (kg)}}{\text{Serum Creatinine (mg/dL)} \times 72} \quad (\times 0.85 \text{ if female})$$

Case #1 Continued

- On day 2, respiratory cultures reveal:
  - Many WBC, few epithelial cells
  - Gram negative bacilli
  - No MRSA isolated

- What would you advise the team next?



AN ANTIBIOTIC ‘TIME OUT’

- A concrete point in time dedicated to reviewing antimicrobial choice and duration:
  - Re-appraise therapy when more clinical data are available (usually in 48-72 hours)
  - Decide about continuation, narrowing therapy and specify a duration

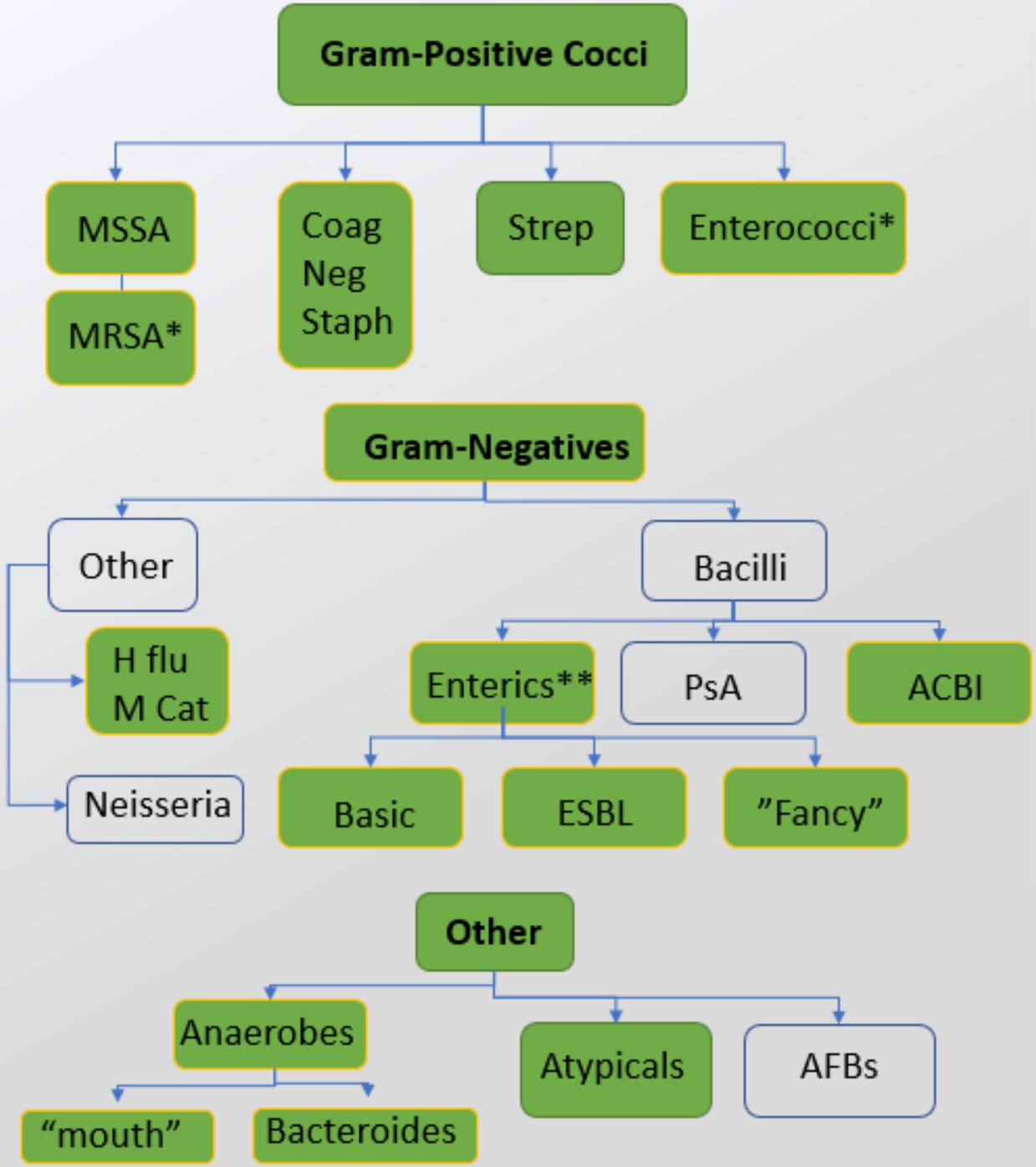
- In general, recommended changes are better received and more likely to be followed at a later time point

AN ANTIBIOTIC ‘TIME OUT’

- Do we still think this patient has a bacterial infection, or is another diagnosis more likely?
- If the patient has a bacterial infection, can we de-escalate?
- Can the patient be switched to an oral antibiotic?
- How long should the patient receive antibiotics?
- Now that you have decided on a final antibiotic, is it prescribed at the right dose?
- Have we documented dose, duration, and indication for all antibiotics?

Case #1 Continued

- Cultures result positive for:
  - Carbapenem resistant *Acinetobacter*
- What would you advise the team next?
- How long would you treat?



Tetracyclines, Glycylcyclines	
Drugs to Remember	**Tetracycline, Doxycycline, Minocycline** **Tigecycline (broadest)**
Gram-positive highlights	Pretty broad *Tigecycline more potent than the others ("good" coverage)
Gram-negative highlights	Tigecycline is broader/more potent than others **May include ESBLS but does not cover "MP3" organisms: *Morganella*, *Pseudomonas*, *Proteus*, *Providencia*
Other highlights	Some anaerobic coverage (tigecycline more than others) Atypicals Interestingly: *Rickettsia* spp., *B burgdorferi*, *H pylori*, *Plasmodium* spp.

Infection/Condition and Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
Hospital Acquired Carbapenem-Resistant *Acinetobacter baumannii* (CRAB) infection treatment options			
Severe infections (HAP/VAP/ BSI with severe sepsis or septic shock)	Less severe infections (BSI without severe sepsis or septic shock)	Less severe infections (SSTI/IAI)	Less severe infections (UTI)
If two in vitro active agents available, Treatment with combination of two in vitro active agents	Monotherapy with an atibiotic if susceptible. For neutropenic patients, combination of two active agents.	Tigecycline 200mg IV stat and 100mg IV q12h OR Minocycline 200mg IV stat and 100mg IV q12h OR Ampicillin-sulbactam 8g/4g IV q8h (high dose)	Ampicillin-sulbactam 8g/4g IV q8h (high dose) OR Trimethoprim-sulfamethoxazole OR An aminoglycoside OR Colistin 300mg CBA loading dose followed by 150-180mg CBA q12h as maintenance starting 12 hours after loading dose (Colistin 9 MIU loading dose followed by 4.5 MIU q12h as maintenance) CBA= Colistin Base Activity MIU= Million International Units
For Pan-drug resistance CRAB infection Ampicillin-sulbactam 8g/4g IV q8h (high dose) PLUS Meropenem 2g IV q8h PLUS Polymyxin B 2.5mg/kg loading dose over 2 hours then 1.5mg/kg IV over 1 hour q12h (Polymyxin B 20,000- 25,000 U/kg loading dose then 12,500-15,000 U/kg IV q12h)	Ampicillin-sulbactam 8g/4g IV q8h (high dose) OR An aminoglycoside OR A polymyxin		

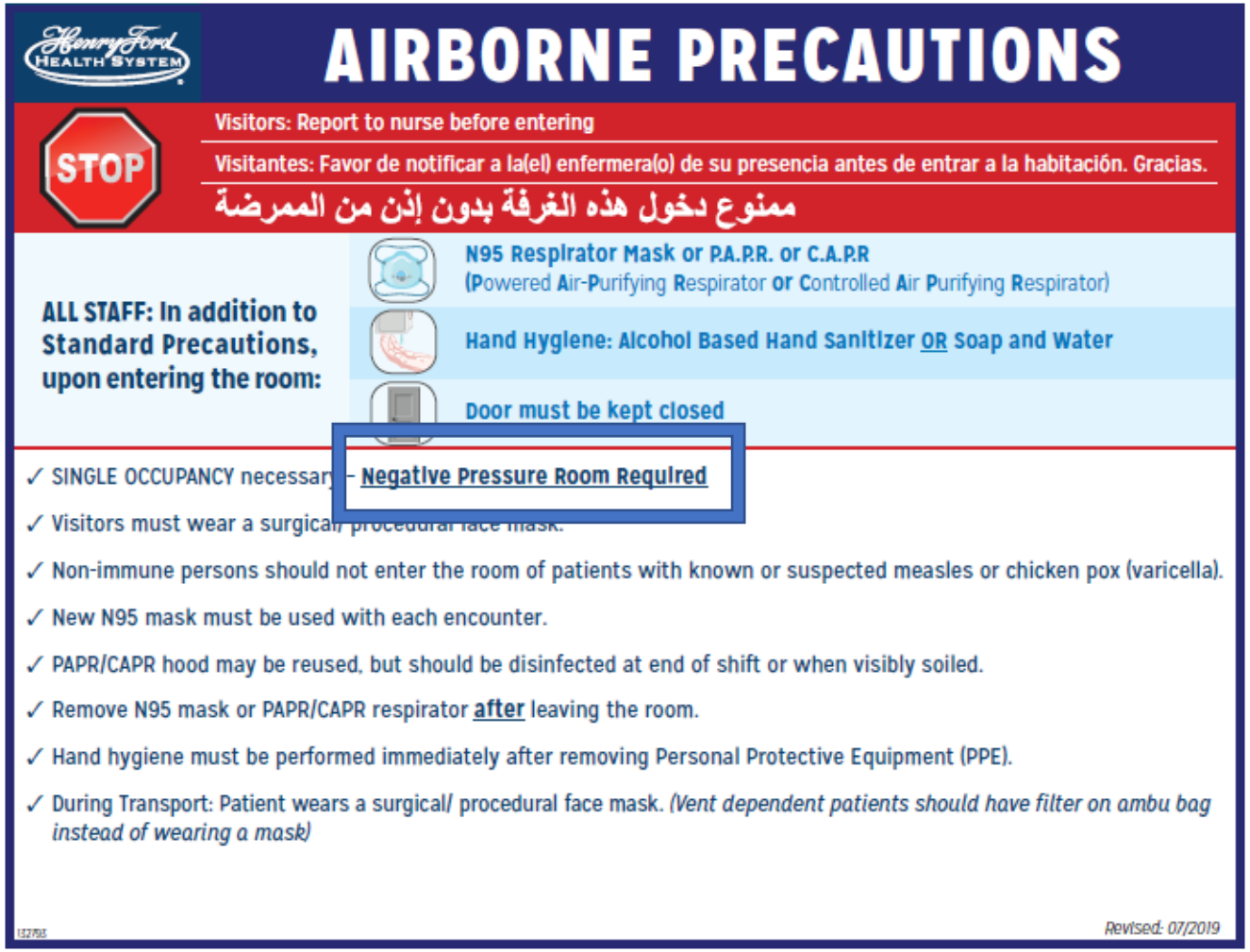
https://www.mohp.gov.np/uploads/AMR/National%20Antimicrobial%20Treatment%20Guidelines%202023.pdf

Case #1 Continued

- The same patient case, however:
  - Respiratory cultures are negative
  - The patient's COVID PCR is positive

- What would you do next?

Airborne Precautions



AIRBORNE PRECAUTIONS

Visitors: Report to nurse before entering

Visitantes: Favor de notificar a la(el) enfermera(o) de su presencia antes de entrar a la habitación. Gracias.

ممنوع دخول هذه الغرفة بدون إذن من الممرضة

ALL STAFF: In addition to Standard Precautions, upon entering the room:

- N95 Respirator Mask or P.A.P.R. or C.A.P.R (Powered Air-Purifying Respirator or Controlled Air Purifying Respirator)
- Hand Hygiene: Alcohol Based Hand Sanitizer OR Soap and Water
- Door must be kept closed

✓ SINGLE OCCUPANCY necessary – **Negative Pressure Room Required**

✓ Visitors must wear a surgical/ procedural face mask.

✓ Non-immune persons should not enter the room of patients with known or suspected measles or chicken pox (varicella).

✓ New N95 mask must be used with each encounter.

✓ PAPR/CAPR hood may be reused, but should be disinfected at end of shift or when visibly soiled.

✓ Remove N95 mask or PAPR/CAPR respirator **after** leaving the room.

✓ Hand hygiene must be performed immediately after removing Personal Protective Equipment (PPE).

✓ During Transport: Patient wears a surgical/ procedural face mask. *(Vent dependent patients should have filter on ambu bag instead of wearing a mask)*

Revised: 07/2019

Common Infections/Conditions
Active tuberculosis
Chickenpox and disseminated zoster (Airborne + Contact precautions)
Measles
SARS-CoV-2 (COVID-19) (Airborne + Contact precautions)

Case #1 Key Points

1. “The Antibiotic Time Out” as a stewardship intervention
2. Empiric (Access) option for multidrug resistant organisms
3. Renal dosing of antibiotics
4. Isolation precautions: contact and airborne

Case #2

Case #2

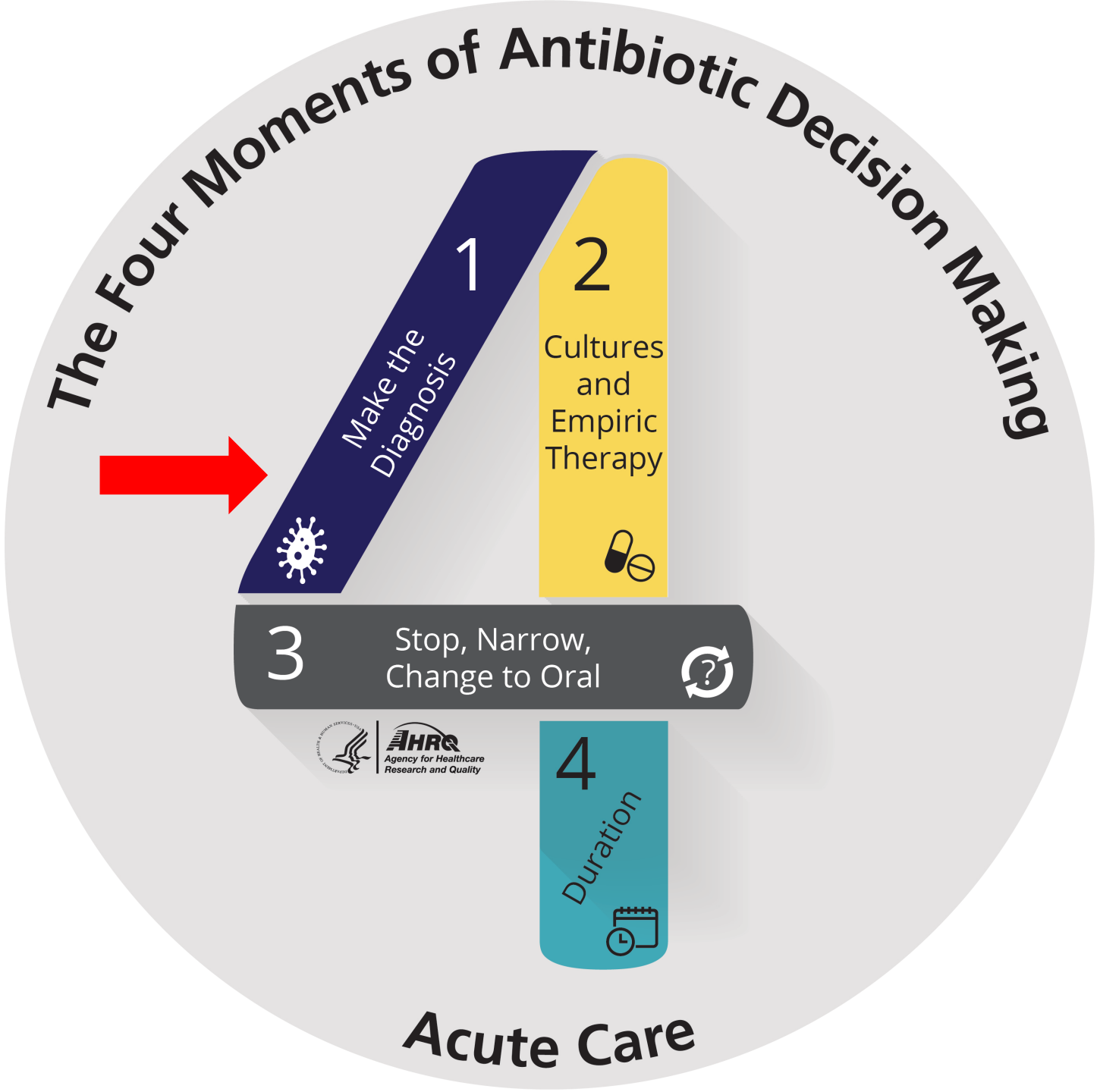
- Ms A is an 80-year-old woman who is hospitalized for a stroke. She has a history of frequent UTI. Over the past year she has had multiple courses of antibiotics.

- Her son frequently visits and is actively engaged. He notes his mother is sleepier than normal, and her urine smells bad. He requests antibiotics.

Case #2 Continued

- Should the physician prescribe antibiotics for Ms. A?
  - Why or why not?

- How would you respond to the son’s request to start the patient on antibiotics?



Four Moments of Antibiotic Decision Making. Content last reviewed November 2019. Agency for Healthcare Research and Quality, Rockville, MD.

What signs and symptoms should raise suspicion of UTI?

- In non-catheterized individuals
  - Dysuria, urinary frequency, urgency
  - History provided by patient has high predictive value
- In catheterized patients
  - Fever, rigors, altered mental status, malaise or lethargy with no other identified cause
  - Flank pain, CVA tenderness, acute hematuria, or pelvic discomfort

Case #2 Continued

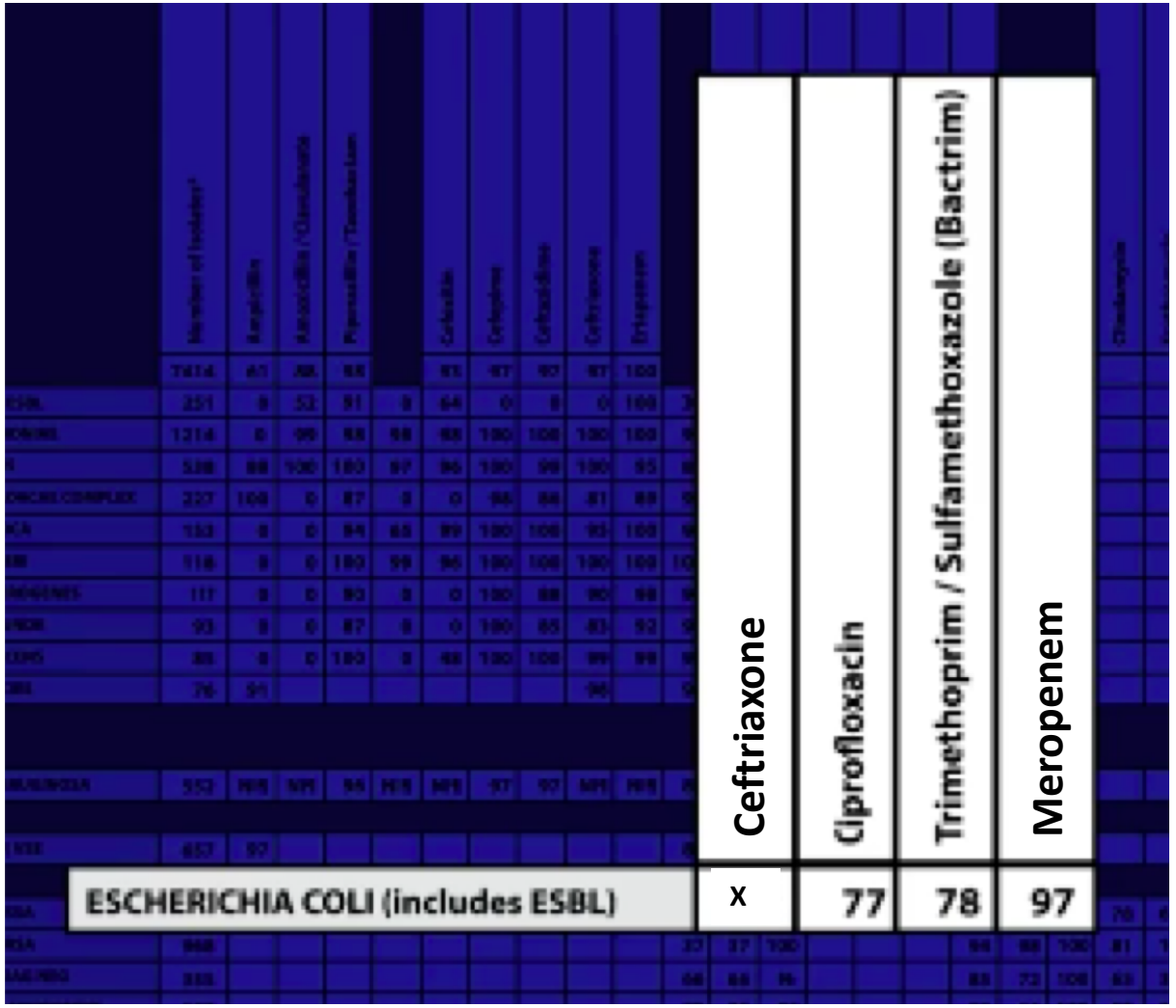
- The same case, but the patient reports dysuria, flank pain, and has a fever.

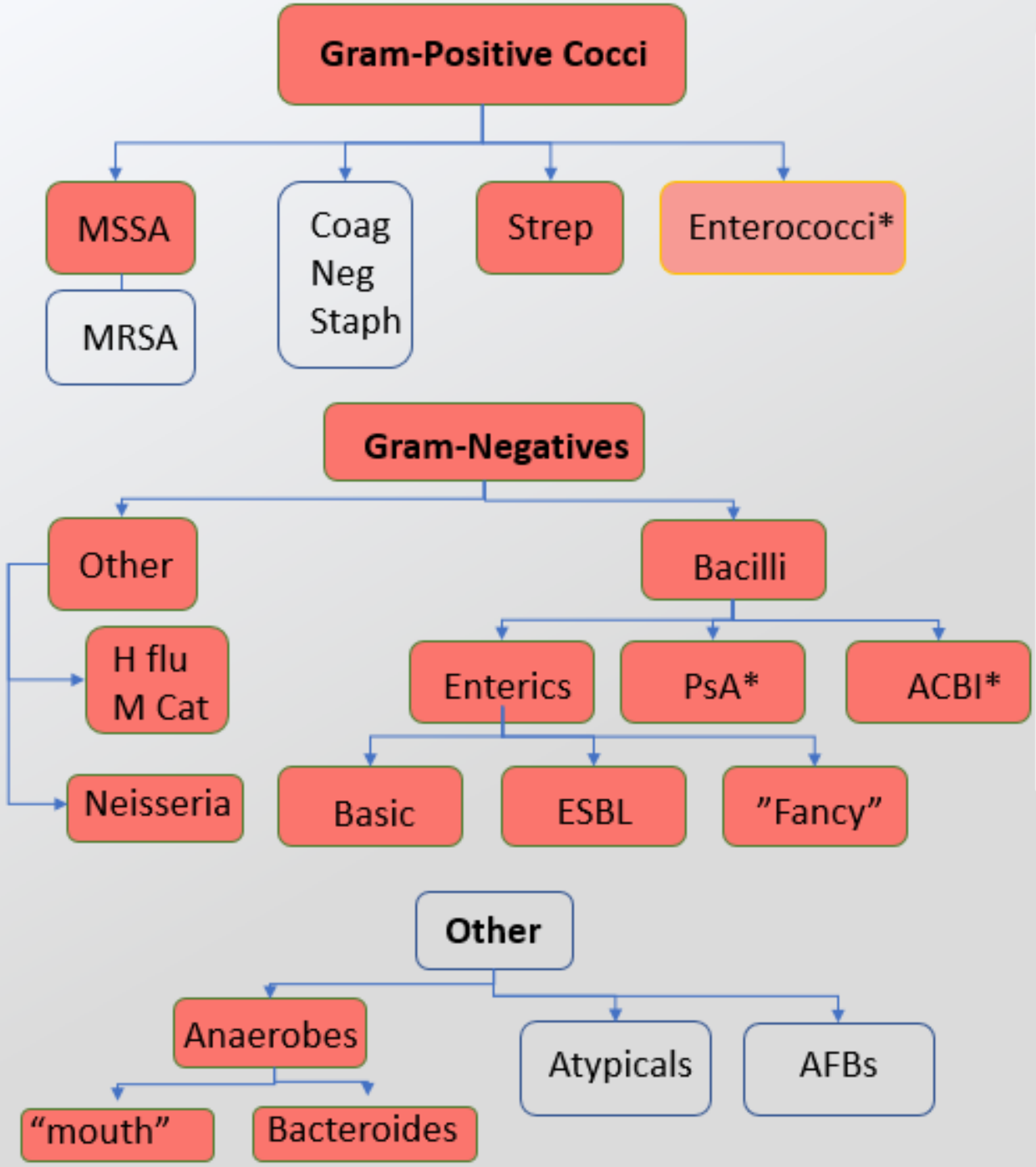
- Now how do you approach the case?
  - What is your first step?

Case #2

Blood cultures result positive for ESBL *E. coli*, susceptibilities are pending. What antibiotic would you choose?

A. Ceftriaxone
B. Ciprofloxacin
C. Trimethoprim/sulfa
D. Ertapenem





Carbapenems	
Drugs to Remember	**Ertapenem**- slightly different spectrum **Imipenem/cilastatin** **Meropenem**
Gram-positive highlights	Broad (Streptococci, MSSA, *E faecalis*) No MRSA, most CoNS are resistant *E. Faecium* usually resistant (similar to ampicillin spectrum) Ertapenem does *not* cover enterococci
Gram-negative highlights	Very Broad. Includes EBSLs, PsA, ACBI Exception: Ertapenem does not cover ACBI or PsA
Other highlights	BROAD anaerobic coverage **Meropenem-vaborbactam- KPC drug**

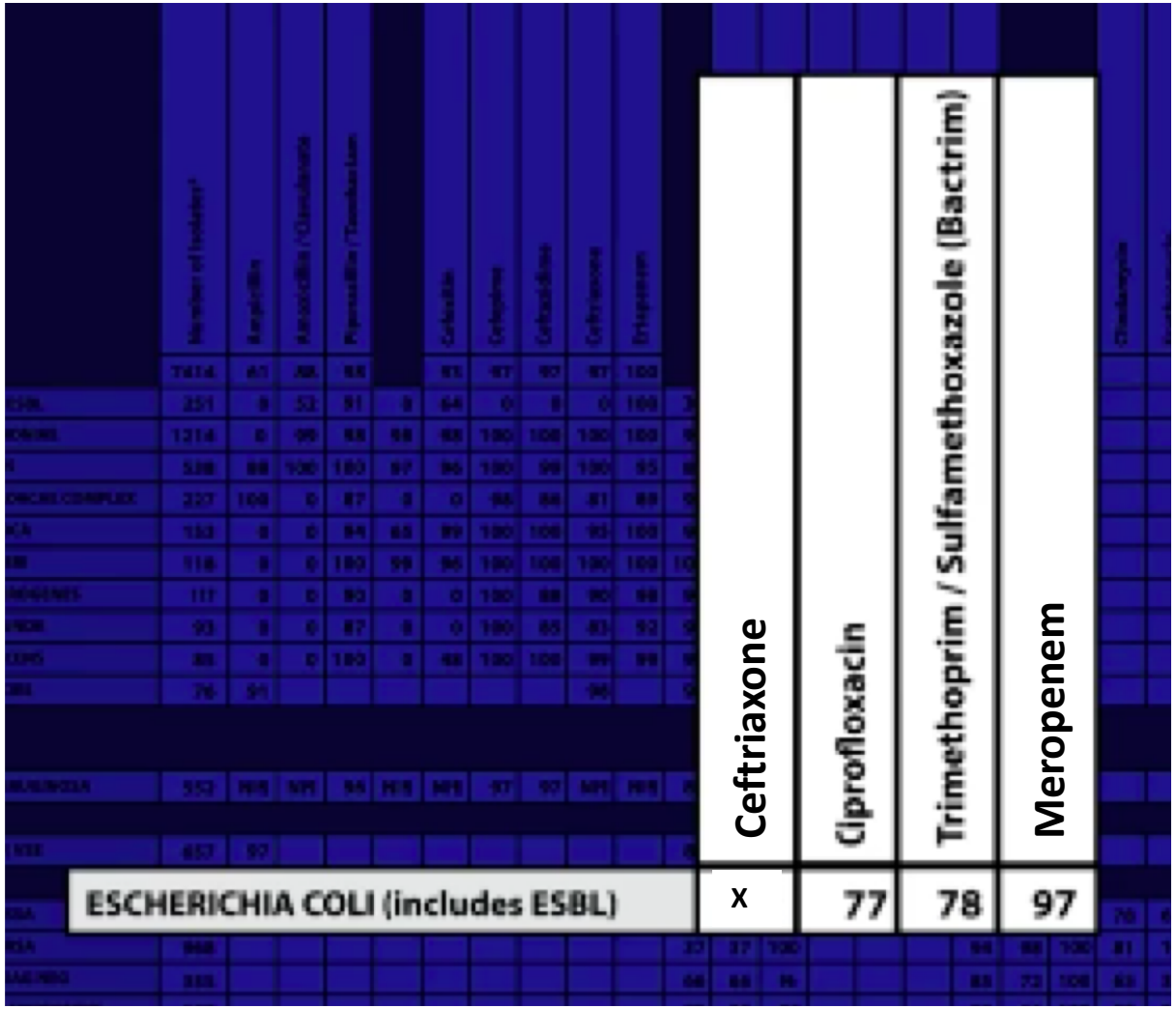
Using Antibiogram for Stewardship

- **Formulary considerations:**
  - Consider formulary changes using the antibiogram as a guide (change agents within the same class)
  - Could add $$$ to specify which antibiotics are most costly for the hospital
- **Antibiotic restriction:**
  - Use of specific agents or classes of agents may be restricted or controlled based on antibiogram susceptibility trends
- **Order set:**
  - Incorporating antibiogram data and trends into hospital-specific order sets, guidelines, and clinical pathways in order to increase or decrease use of specific agents based on susceptibility

Case #2

She clinically improves, becomes afebrile on day 2 of ertapenem. The patient is nearing time for discharge. She regularly has issues with confusion. What antibiotic will you choose at discharge?

A. Ceftriaxone
B. Ciprofloxacin
C. Trimethoprim/sulfa
D. Ertapenem



Intravenous to Oral Dose Conversion

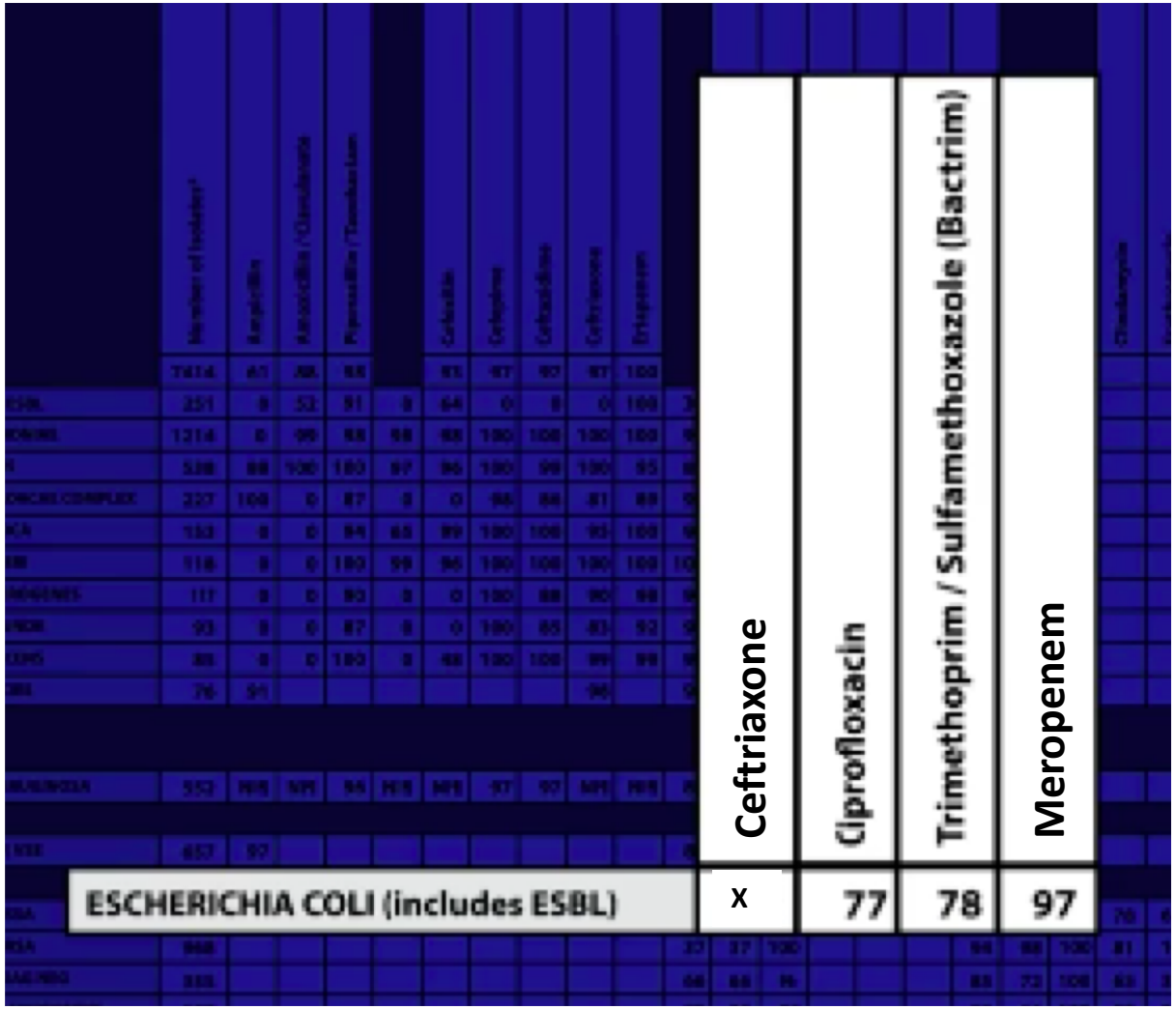
- **Inclusion Criteria – Anti-Infectives**
- Afebrile (T <38°C, 100.4°F) for at least 24 hours
- Resolving/normalizing WBC (unless on oral or injectable steroids)

- **Exclusion Criteria – Anti-infectives**
- Neutropenia (ANC <1000)
- Endocarditis
- Meningitis or brain abscess
- Clostridium difficile infection
- S aureus bacteremia
- Feeding tubes with intestinal access only (applies to fluoroquinolones only)

Case #2

What antibiotic will you choose if the patient has hyperkalemia with an acute kidney injury but does not have issues with confusion?

A. Ceftriaxone
B. Ciprofloxacin
C. Trimethoprim/sulfa
D. Ertapenem



Case #2 Continued

- The team writes a prescription for an additional 14 days of cipro, in addition to the 3 days of effective therapy the patient received in the hospital.

- How do you approach this issue with the team?
  - What is the next step?

Case #2 Key Points

1. The four moments of antibiotic decision making
2. Urinary tract infections and asymptomatic bacteriuria
3. Extrapolating data from an antibiogram
4. Carbapenems spectrum of activity
5. IV to Oral Conversion
6. Duration optimization

Case #3

Case #3

- A 68-year-old woman with ischemic cardiomyopathy is admitted to the ICU with decompensated heart failure and has a central line placed. She improves and is transferred to the medical floor on hospital day 7, on IV furosemide and metolazone. Today, she has a fever.
- Vitals: T 38.5, HR 92, RR 18, BP 118/76, O2 97% on room air
- Exam: Diaphoretic. Insertion site of central line is erythematous.
- Micro: Blood cultures result positive for gram positive cocci in clusters.

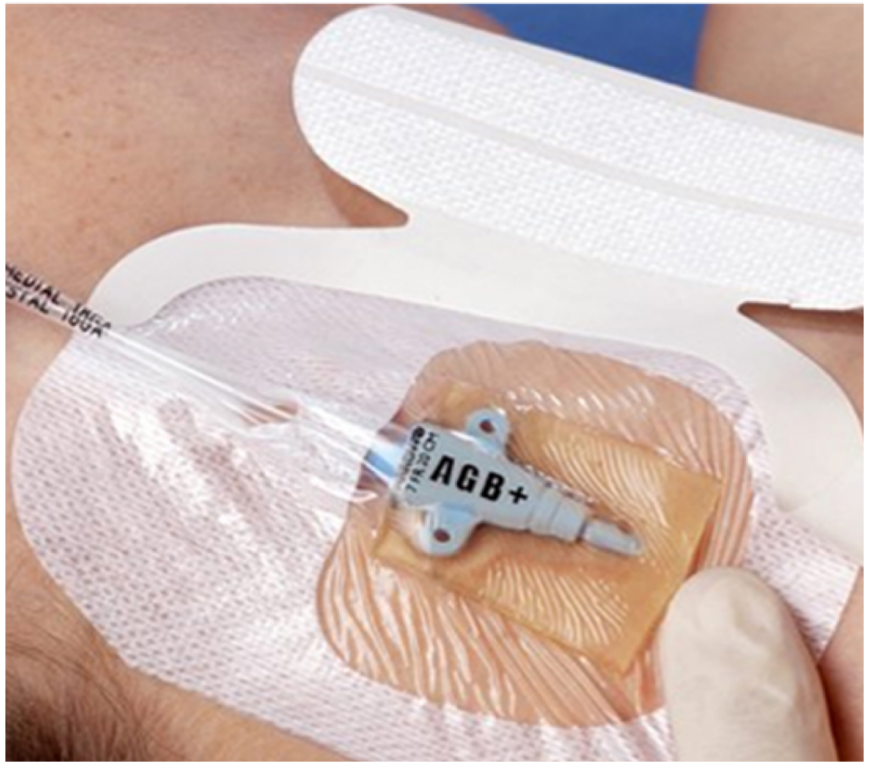
Case #3 Continued

- What do you suspect is the potential source of this patients' bacteremia?

- What do you do next?

CLABSI Prevention

1. Optimal site selection
2. Maximal sterile barrier precautions upon insertion
3. Chlorhexidine skin antisepsis
4. CHG-impregnated dressing
5. Daily 2% chlorhexidine cleansing
6. Hand hygiene and aseptic technique
7. **Daily review of central line necessity and prompt removal of unnecessary lines**



Case #3

- The chest x-ray shows volume overload. There are no other signs of infection. In addition to removing the line, the team empirically starts vancomycin. With the vancomycin, they add meropenem “just in case there is another infection”.
- The electronic medical record alerts the team that the restricted antibiotic, meropenem, has been ordered without a documented indication.

- What do you do next?

PROSPECTIVE AUDIT

- A physician reviews orders and intervenes with modification of order and feedback to prescriber
- Results in improved use, decreased costs
- Caveats:
  - Time and labor intensive
  - Many settings do not have capacity
  - Providers may not be receptive

FORMULARY RESTRICTION AND PREAUTHORIZATION

- Specific antibiotics cannot be ordered without authorization
- Useful in response to healthcare-associated outbreak

Enhancing Stewardship Strategies in EMR

- Might broadly improve antimicrobial use:
  - Inclusion of indication, which prompts clinicians to consider the reason for ordering the antimicrobial
  - Inclusion of duration on all antimicrobial orders in EMR, so that stop dates are not missed or overlooked
  - Automated alerts “antimicrobial time-out” at 48-72 hours to review if new culture results have returned, or if de-escalation may be appropriate

- Criterion-based antimicrobial restriction: requires providers to select criteria from a pre-determined menu before medication is dispensed

Case #3 Key Points

1. In-person assessment versus chart review
2. Prevention of central line associated bloodstream infections (CLABSI)
3. Prospective audit and feedback
4. Formulary restriction
5. Role of the electronic medical record in stewardship

Case #4

Case #4

- You are reviewing the medical record of a patient who developed a surgical site infection.
- 56 year-old-man status post exploratory laparotomy due to perforated diverticulitis. One week post discharge, he presents with new onset fever, redness, and purulent drainage from his wound. The wound has now dehisced. Wound cultures result positive for MSSA.

- You note the patient received clindamycin instead of cefazolin for pre-operative prophylaxis.

Case #4 Continued

- Upon further review, you note there was an allergy alert that the patient had an allergy to penicillin as a child (rash).
  - What would you do to confirm if they are allergic to penicillin?
- How would you approach this case?
- What is your institutions practice when you have surgical site infections (SSI)?
  - What other HAI does your institution document, audit, and report?
  - What are common barriers you have identified?

Surgical Site Infections

- SSIs occur in 2-5% of patients undergoing inpatient surgery
  - 60% of SSIs are preventable
  - Associated with increased LOS, cost, and mortality

- Prevention:
  - Appropriate peri-operative antibiotic prophylaxis
  - Hair removal should be avoided unless it interferes with surgery, otherwise should be performed as close to the time of surgery as possible
  - Use alcohol-containing pre-operative skin preparatory agents
  - Control blood glucose post-operatively

Intervention options

- Education
- Guidelines (include surgical, outpatient)
- Pre prescription review and restrictions
- Post prescription review (48 to 72 hrs)
- The “Time out” (48 to 72 hrs)
- Stop orders
- De escalation, redundant therapy
- IV to oral conversion
- Optimize dosing
- Audit and feedback (Ward rounds)
- Vendor restriction
- Use of EMR/ how IT can be of benefit
- Duration
- Allergy evaluation
- Regulatory

Case #4 Continued

- As an integral member of the stewardship team, what do you do next?
- How do you prevent this from happening again?
- What specific steps would you take?
  - PDSA Cycle

Guideline Content

- Empiric antibiotic selection
  - Organism and disease state specific
- Definitive antibiotic selection
  - Organism and disease state
- IV to oral conversion
- Renal dosing
- Duration of therapy

Case #4 Key Points

1. Auditing of hospital acquired infections
2. Surgical site infections
3. Allergy reviewing as a stewardship intervention
4. Utilizing the EMR for stewardship interventions
5. Guideline editing

Thank you.