



# **ANTIMICROBIAL STEWARDSHIP PEARLS: ANTIBIOTIC TREATMENT AND PROPHYLAXIS DURATION**

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# DISCLOSURE

I have nothing to disclose as far as financial or otherwise vested interest in any of the products included in this presentation.



# OBJECTIVES

1. Demonstrate an understanding of the new antimicrobial stewardship (AMS) standard for hospitals from The Joint Commission.
2. Identify the appropriate duration of antibiotic treatment for osteomyelitis and endocarditis.
3. Discuss new recommendations for duration of antibiotic prophylaxis for certain elective surgeries.



# OVERVIEW

Background

New Joint Commission Standard

Overview of osteomyelitis treatment

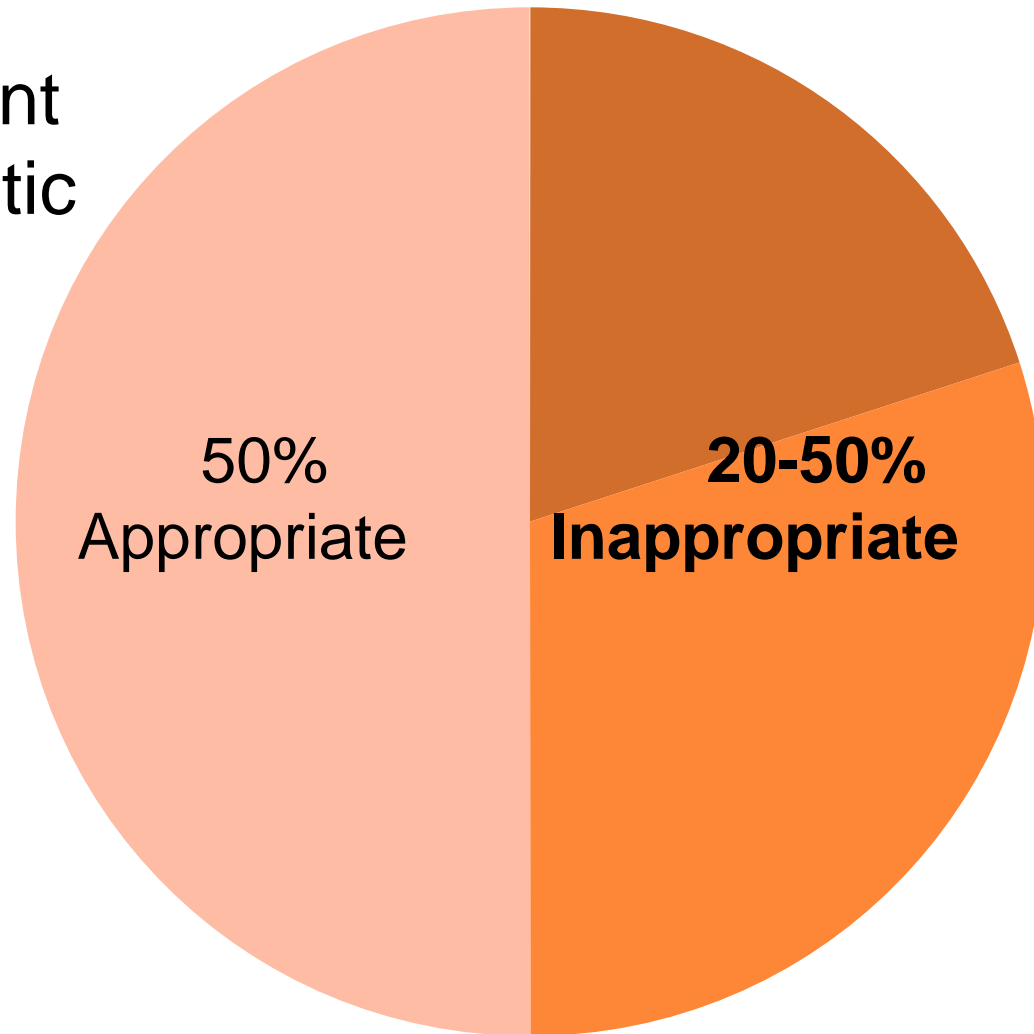
Overview of endocarditis treatment

CDC guidelines for prevention of surgical site infections (SSI)

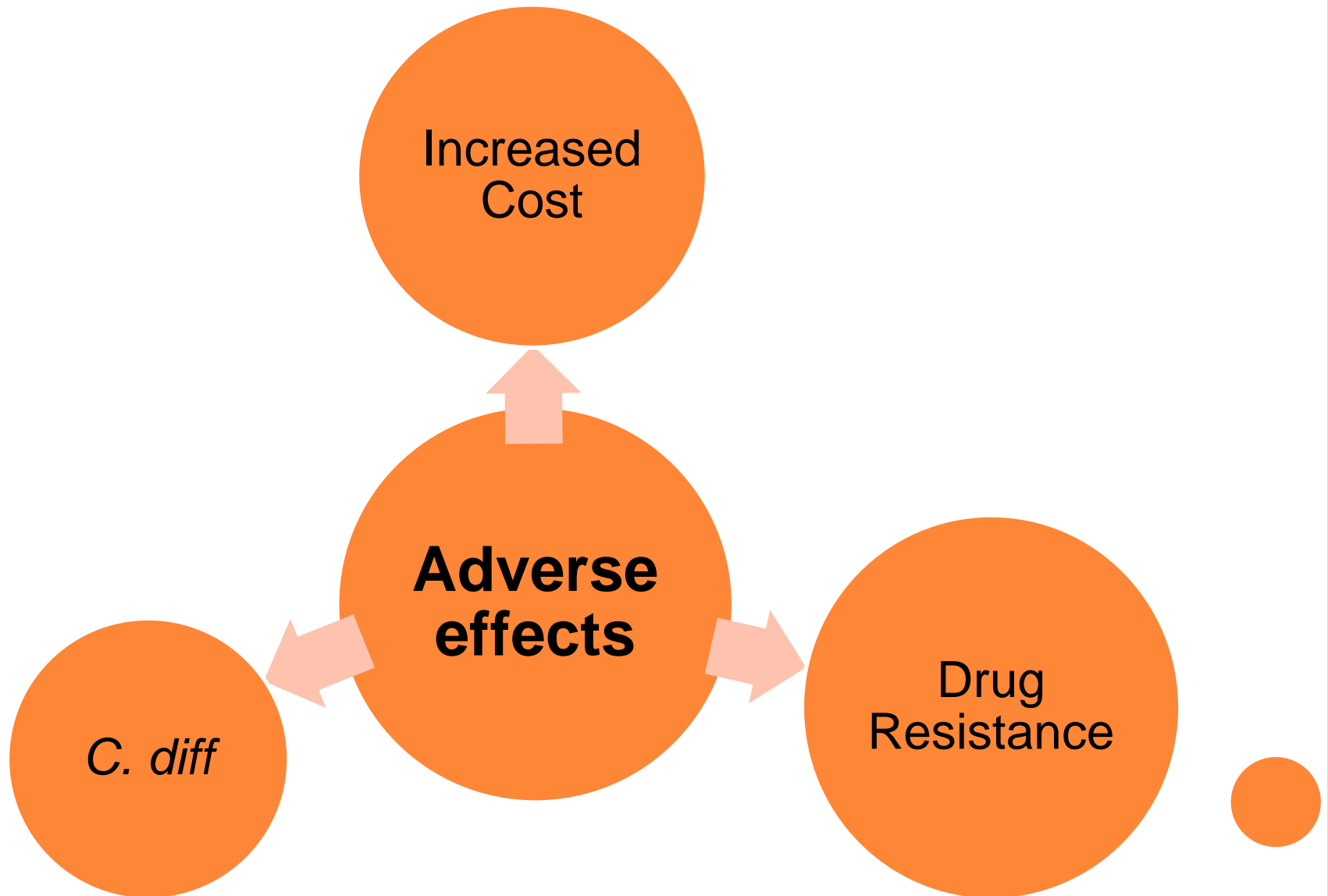


## BACKGROUND – CDC DATA

Inpatient  
Antibiotic  
Use



# BACKGROUND – ANTIBIOTIC OVERUSE



WHAT'S YOUR FAVORITE KIND OF SHIP?

A. General transport

B. Cruise

C. Friend

D. Antimicrobial Steward

# BACKGROUND – ANTIBIOTIC STEWARDSHIP

## Stewardship

- Management and planning of resources

## Goals

- Streamline antibiotics
- Limit to appropriate durations

## Streamline

- Decreasing amount of antibiotics
- Changing to narrower spectrum



# JOINT COMMISSION STANDARD

AMS established as organizational priority

Educate staff in antimicrobial use and AMS

Educate patients and families

AMS multidisciplinary team

AMS program includes core elements

AMS program establishes multidisciplinary protocols

Collect, analyze, report AMS program data

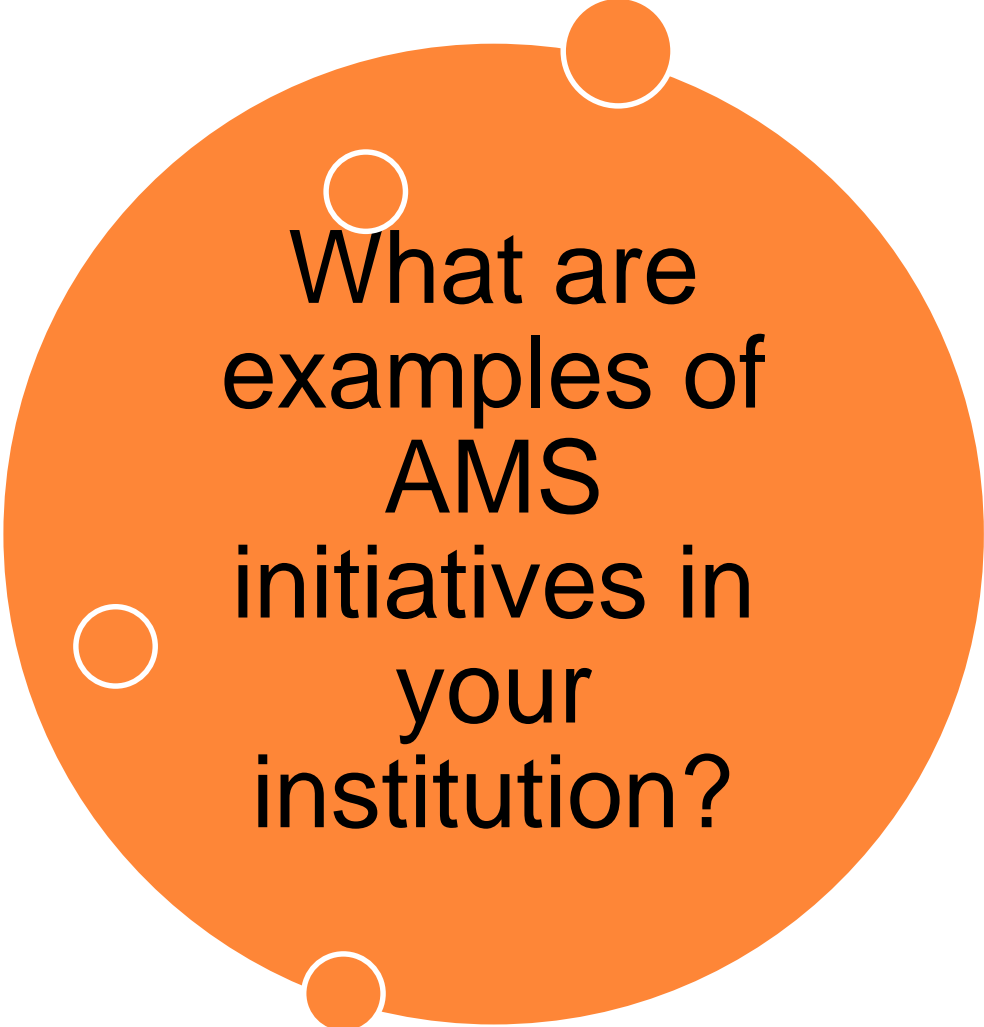
Take action to improve AMS program

# JOINT COMMISSION STANDARD

## AMS Program Core Elements

- Leadership commitment
- Accountability
- Drug expertise
- Action
- Tracking
- Reporting
- Education

# JOINT COMMISSION STANDARD



What are  
examples of  
AMS  
initiatives in  
your  
institution?

# JOINT COMMISSION STANDARD – EXAMPLES OF AMS PROGRAM

## Protocol

- Antibiotic Formulary Restrictions

## Education

- Antibiotic Guide

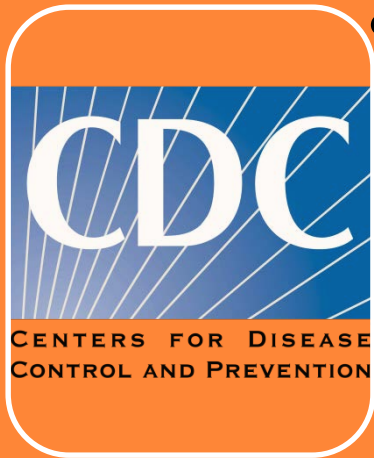
## Action

- Antibiotic “Time Out”



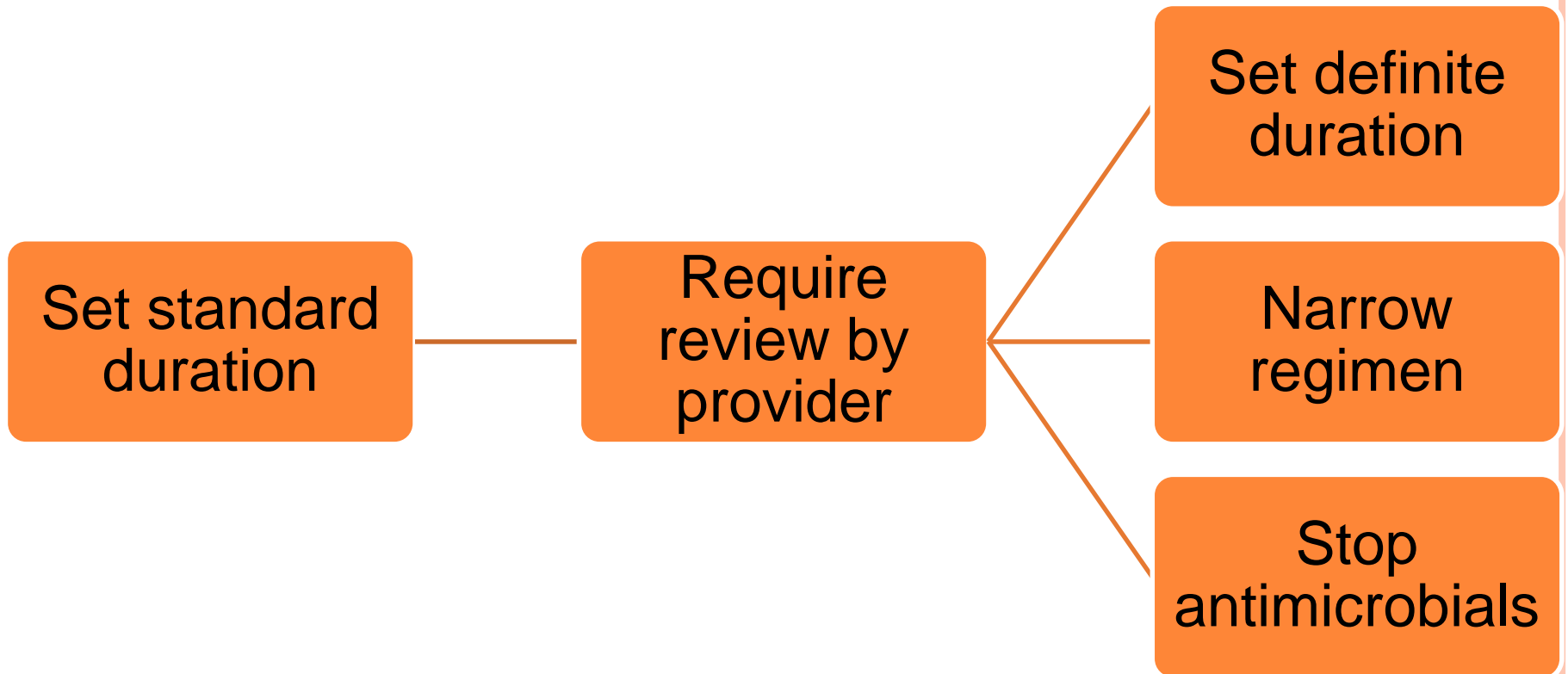
# ANTIBIOTIC “TIME OUT”

## CDC Definition



- Set time interval at which the provider is encouraged to reassess the ongoing treatment with antibiotics
- Occurs at a time when more clinical and laboratory data will be available

# ANTIBIOTIC “TIME OUT”



# SELF-STEWARDSHIP TIME OUT FOR VANCOMYCIN AND PIPERACILLIN-TAZOBACTAM

Retrospective review post-implementation of clinical informatics supported self-stewardship program

At day 3 of antibiotic use the order automatically expired

Prescriber received alert and was prompted to complete continuation template

Template recommended either continuation or cessation of therapy

# SELF-STEWARDSHIP TIME OUT FOR VANCOMYCIN AND PIPERACILLIN-TAZOBACTAM

Retrospective review post-implementation of clinical informatics supported self-stewardship program

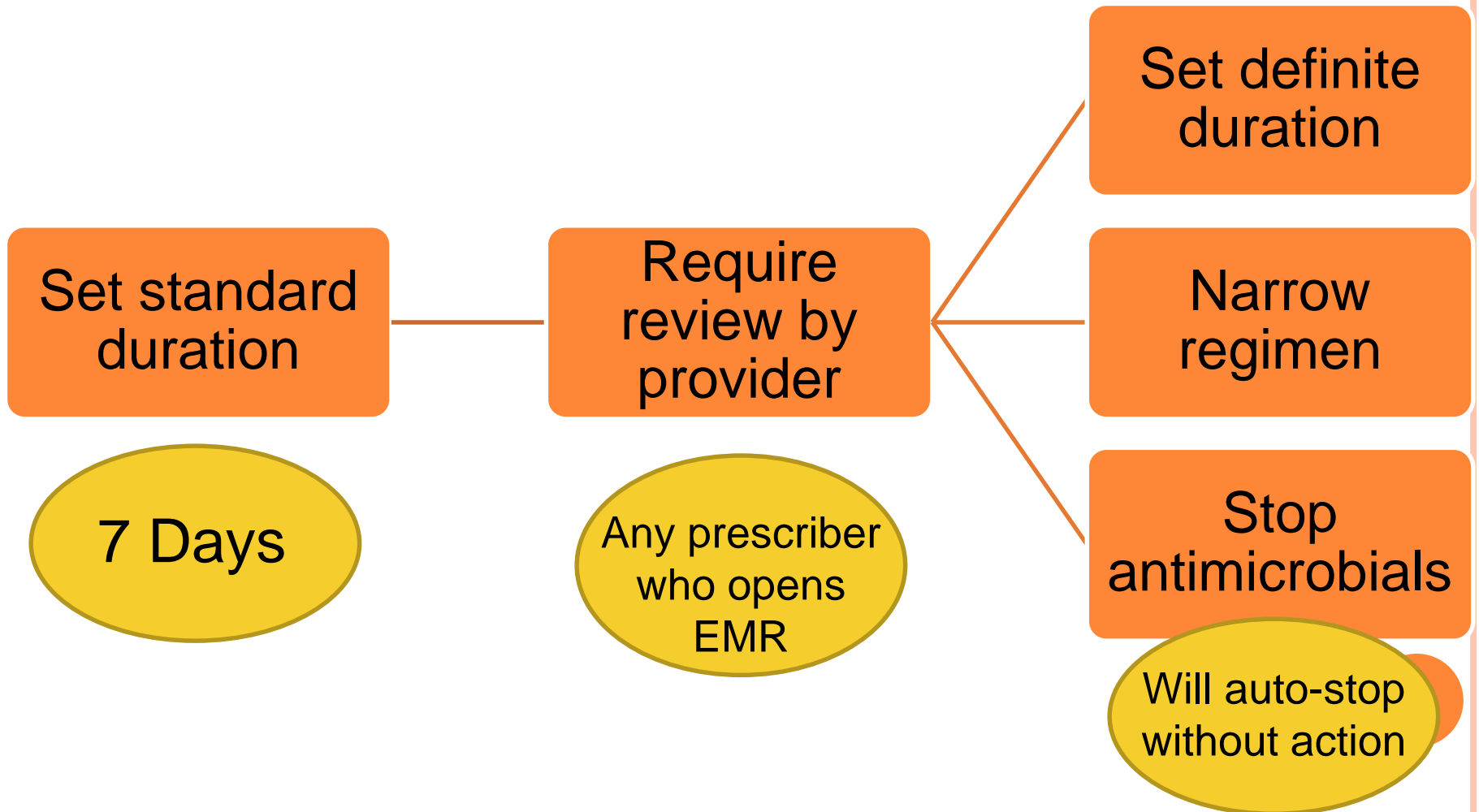
93/154  
vancomycin  
prescriptions  
discontinued  
by day 5 (64%  
vs. 48% pre-  
intervention)

70/105  
piperacillin-  
tazobactam  
prescriptions  
discontinued  
by day 5 (62%  
vs. 67% pre-  
intervention)

Survey of 32  
physicians  
relayed  
moderate  
satisfaction



# ANTIBIOTIC “TIME OUT”



# WHY IS ANTIBIOTIC “TIME OUT” AN IMPORTANT INTERVENTION IN AMS?

A. It will prompt discontinuation of inappropriate empiric antibiotics once infection has been ruled out.

B. Many infections can be treated in a short course of therapy and this will prevent prolonged durations which promote antibiotic resistance.

C. It will require the provider to evaluate whether or not antibiotics can be de-escalated if further therapy is warranted.

D. All of the above.

# WHAT ARE THE DISADVANTAGES TO ANTIBIOTIC “TIME OUT”?

Not a perfect replacement for thorough clinical judgement

Prescriber inconvenience

Inappropriate discontinuation of needed prolonged therapy



# OSTEOMYELITIS

## Pathogenesis

Direct Inoculation

Hematogenous

Soft tissue  
infection

Open fracture

Infection  
seeding from  
bacteremia



# OSTEOMYELITIS – TREATMENT

Broad Therapy

Narrow Therapy

Empiric

Culture  
Driven

# OSTEOMYELITIS – TREATMENT

Shorter Duration

Longer Duration

Acute  
Infection

Chronic  
Infection

# OSTEOMYELITIS - TREATMENT

Gram Positive  
Coverage

*S. aureus, Strep,  
and  
Enterococcus*

Vancomycin

Gram Negative  
Coverage

*P. aeruginosa,  
Enterobacteriaceae*

Cefepime  
Fluoroquinolone

Potential  
Adjunctive  
Therapy

Anaerobic  
organisms

Metronidazole  
Clindamycin

WHAT IS THE INCIDENCE OF RECURRENCE OF  
OSTEOMYELITIS IN ADULTS?

A. 70%

B. 50%

C. 30%

D. 15%





# OSTEOMYELITIS – CHRONIC INFECTION

**Parenteral therapy**

2 to 6 weeks



**Oral Therapy**

4 to 8 weeks



**Reduce Recurrence**

30% incidence in adults



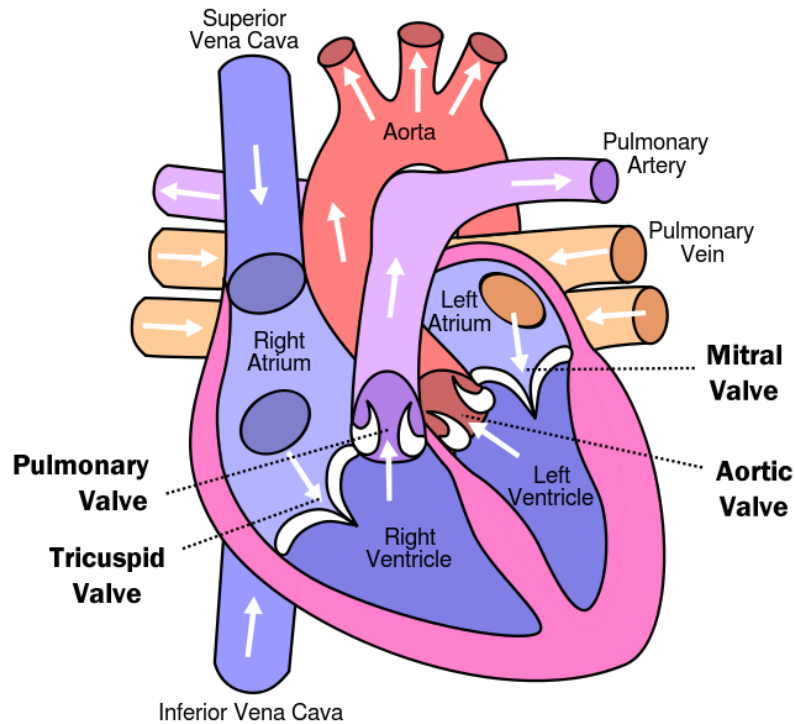
# ENDOCARDITIS

Sepsis

Pneumonia

IA Abscess

Endocarditis



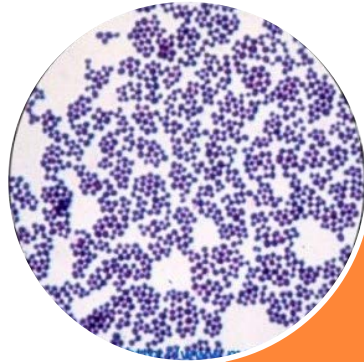
Baddour LM, et. al. Circulation. 2015 Oct 13;132(15):1435-86.

Picture from: <http://www.ucdenver.edu/academics/colleges/medicalschoo/departments/surgery/divisions/CardiothoracicSurgery/Types-of-Surgery/Pages/Heart-Valve-RepairReplacement.aspx>

# ENDOCARDITIS – EPIDEMIOLOGIC TRENDS



Prosthetic valve



Staphylococci

Baddour LM, et. al. Circulation. 2015 Oct 13;132(15):1435-86.

Pictures from: <http://emedicine.medscape.com/article/780702-overview>

<http://www.medicofem.com/index.php/microbiology/microbiology-practical-aspects/staphylococci/>

# ENDOCARDITIS - TREATMENT

Common Organisms	Recommended Regimens	Alternatives or Synergy
<i>Streptococcus</i> (PCN-susceptible)	Penicillin G or Ceftriaxone	Vancomycin for PCN allergy Gentamicin for synergy
MSSA	Nafcillin or Oxacillin	Cefazolin for minor PCN allergy
MRSA	Vancomycin	Daptomycin Add gentamicin and rifampin for synergy if prosthetic involved
<i>Enterococcus</i> (PCN-susceptible)	Ampicillin or Penicillin G	Gentamicin for synergy May also use ceftriaxone for synergy with ampicillin
<i>Enterococcus</i> (PCN-resistant)	Vancomycin	Gentamicin for synergy
VRE (PCN-resistant)	Linezolid or Daptomycin	

PCN = Penicillin

Baddour LM, et. al. Circulation. 2015 Oct 13;132(15):1435-86.

# ENDOCARDITIS - TREATMENT

## 2 Weeks

Streptococcal infection without abscess or prosthetic

Combo therapy with PCN or ceftriaxone and gentamicin

## 4 Weeks

Streptococcal infections treated with vancomycin

Poor renal function unable to tolerate gentamicin

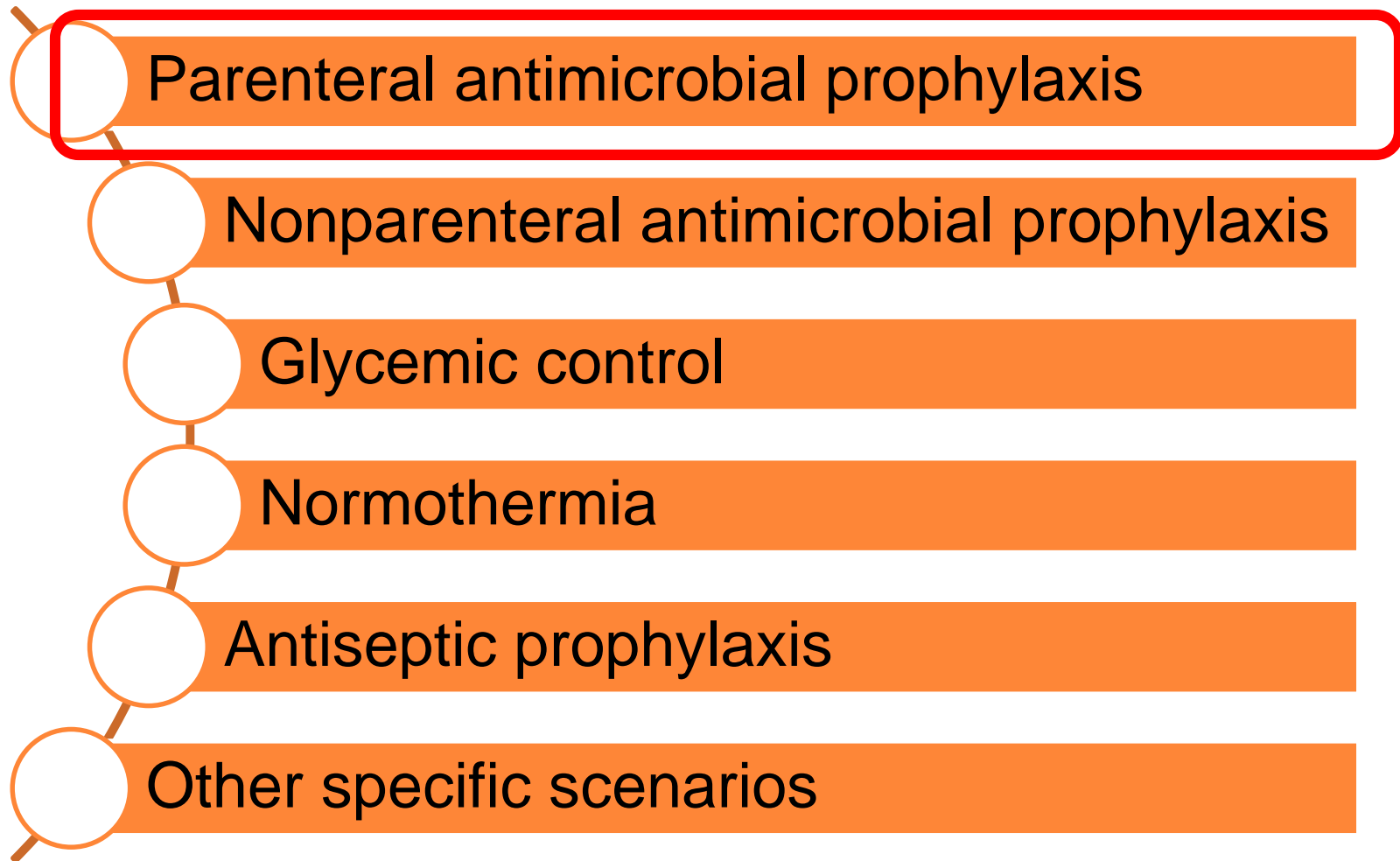
## 6 Weeks

Gram negative bacteria

Enterococcus or Staphylococci

Prosthetic valve

# CDC GUIDELINE FOR PREVENTION OF SSI



# PARENTERAL ANTIMICROBIAL PROPHYLAXIS




What is the optimal timing of preoperative AMP?

What is the optimal timing of preoperative AMP in C-section?

How safe and effective is weight-adjusted AMP dosing?

How safe and effective is postoperative AMP and what is the optimal duration?



# PARENTERAL ANTIMICROBIAL PROPHYLAXIS

AMP preop timing should achieve bactericidal concentration in the serum and tissues when the incision is made

No further refinement of timing can be made



Administer AMP before skin incision in all cesarean section procedures.

This is beneficial as opposed to immediately after umbilical cord clamping



No studies were identified to evaluate weight-based dosing of AMP.

Refer to previously published guidelines.





# PREVENTION OF SSI – ANTIBIOTIC DOSING

Drug (IV)	Adult Dosing	Pediatric Dosing	Redose Time (hours)
Ampicillin/sulbactam	3g (2g ampicillin/1g sulbactam)	50mg/kg ampicillin component	2
Ampicillin	2g	50mg/kg	2
Aztreonam	2g	30mg/kg	4
Cefazolin	2g (pt wt <120 kg), 3g (pt wt ≥ 120kg)	30mg/kg	4
Cefotaxime	1g	50mg/kg	4
Cefoxitin	2g	40mg/kg	2
Cefotetan	2g	40mg/kg	6

# PREVENTION OF SSI – ANTIBIOTIC DOSING

Drug (IV)	Adult Dosing	Pediatric Dosing	Redose Time (hours)
Ceftriaxone	2g	50-75mg/kg (not for patients < 28 days)	NA
Ciprofloxacin	400mg	10mg/kg	NA
Clindamycin	900mg	10mg/kg	6
Ertapenem	1g	15mg/kg	NA
Fluconazole	400mg	6mg/kg	NA
Gentamicin	5mg/kg (based on dosing weight, single dose)	2.5mg/kg (based on dosing weight)	NA
Levofloxacin	500mg	10mg/kg	NA

# PREVENTION OF SSI – ANTIBIOTIC DOSING

Drug (IV)	Adult Dosing	Pediatric Dosing	Redose Time (hours)
Metronidazole	500mg	15mg/kg Neonates weighing <1200g should receive 7.5mg/kg dose	NA
Piperacillin/tazobactam	3.375g	80 -100mg/kg of the piperacillin component dependent on patient age	2
Vancomycin	15mg/kg (max 2gm)	15mg/kg	NA

# PARENTERAL ANTIMICROBIAL PROPHYLAXIS



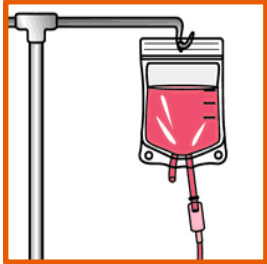
What is the optimal timing of preoperative AMP?

What is the optimal timing of preoperative AMP in C-section?

How safe and effective is weight-adjusted AMP dosing?

How safe and effective is postoperative AMP and what is the optimal duration?

# CDC GUIDELINE FOR PREVENTION OF SSI



## Preoperative

- Use antimicrobials when appropriate
- Timing to reach optimal concentration prior to incision
- Weight-adjusted dosing may be beneficial



## Postoperative

- Clean and clean-contaminated procedures do not require additional prophylaxis after skin closure
- Not required even in presence of drains

# Clean



No entrance to  
respiratory,  
alimentary and  
genitourinary  
tracts

No  
inflammation is  
encountered

Sterile  
technique  
maintained

Elective  
spinal,  
orthopedic  
and vascular  
surgeries

# Clean-Contaminated

Entrance into  
respiratory,  
alimentary and  
genitourinary  
tracts

No  
contamination  
is encountered

Sterile  
technique  
maintained

Elective  
thoracic,  
bowel,  
OB/GYN  
surgeries



# Contaminated

Gross spill from  
gastrointestinal  
tract, Open  
trauma > 12-24  
hours old

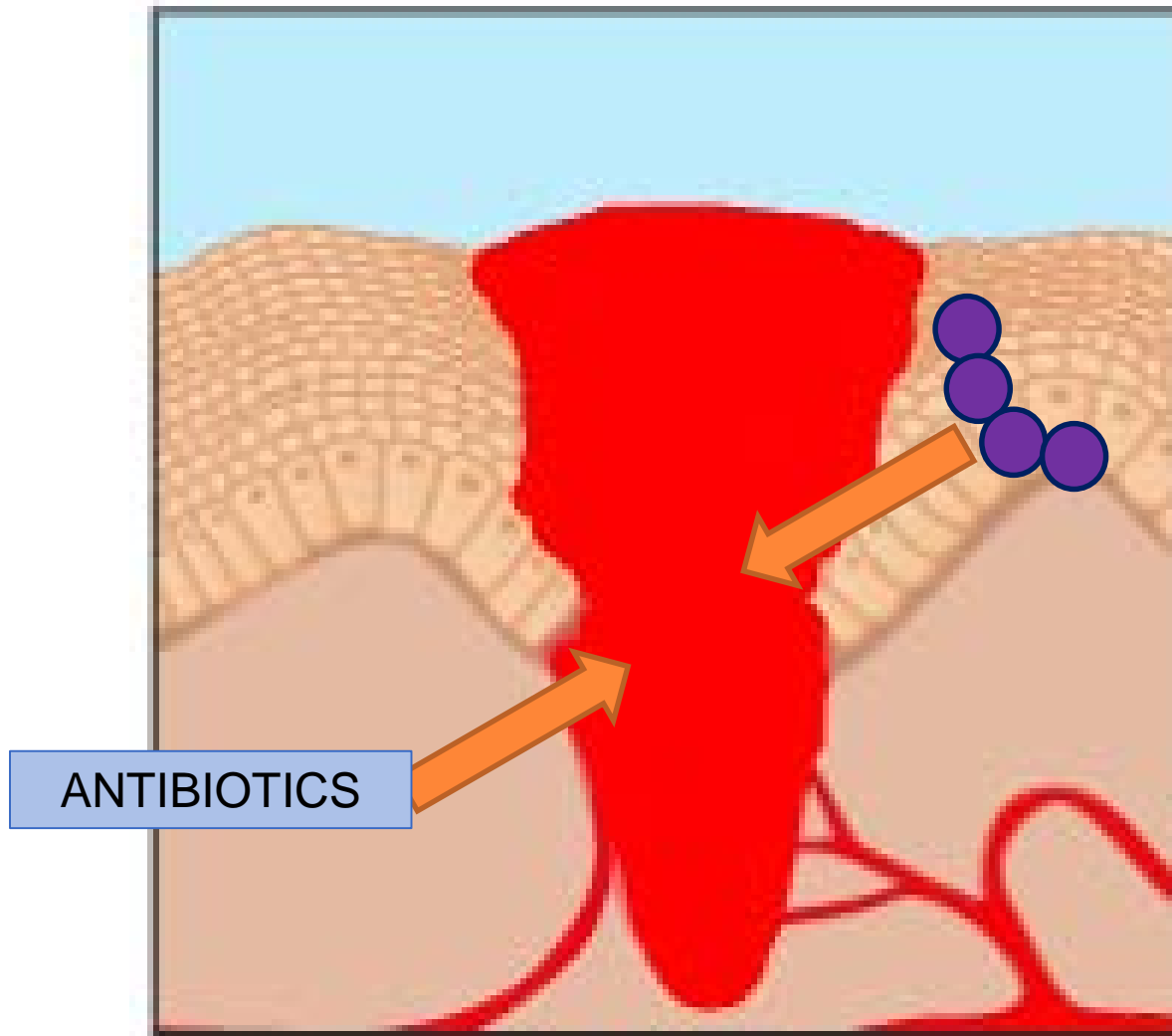
Non-purulent  
inflammation

Major break  
in sterility

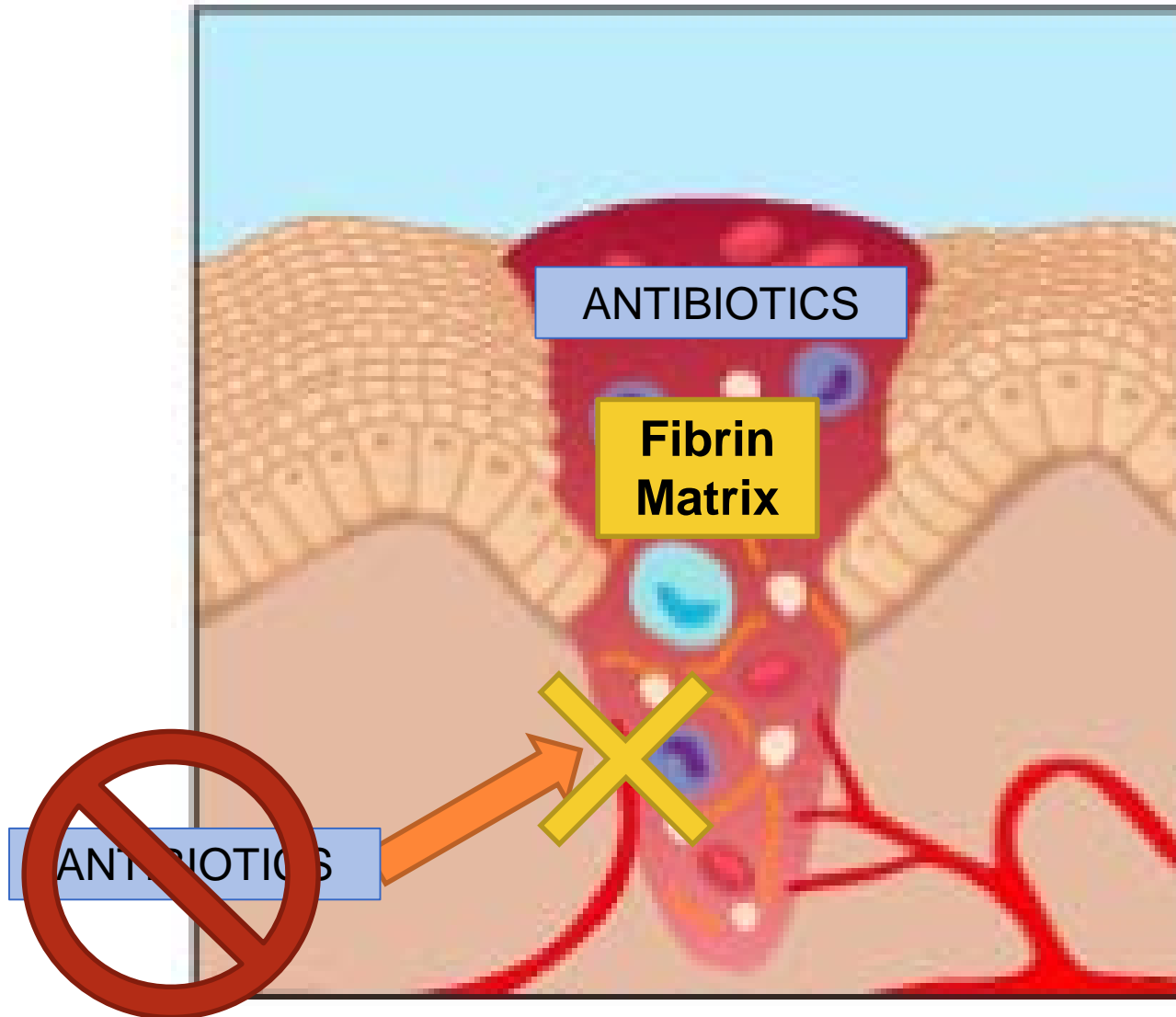
Major  
trauma,  
fistula  
repair




# WHY DON'T POSTOP ANTIBIOTICS WORK?



# WHY DON'T POSTOP ANTIBIOTICS WORK?



# POST-OPERATIVE ANTIMICROBIALS FOR CLEAN, CLEAN-CONTAMINATED SURGERY



Meta-analysis of 21 RCTs	<ul style="list-style-type: none"><li>• N=14,285</li><li>• 24hrs postop prophylaxis vs. none</li></ul>
General, Cardiothoracic, Orthopedic, Gynecologic, Urologic	<ul style="list-style-type: none"><li>• Non-perforated appendicitis</li><li>• Total joint replacements</li><li>• Hysterectomy, C-section</li><li>• Oncologic procedures</li></ul>
No benefit to continuing antimicrobials postop	<ul style="list-style-type: none"><li>• OR 1.19 (0.94-1.5)</li><li>• P=0.15</li><li>• I<sup>2</sup>=25%</li></ul>

# POST-OPERATIVE ANTIMICROBIALS FOR CLEAN, CLEAN-CONTAMINATED SURGERY

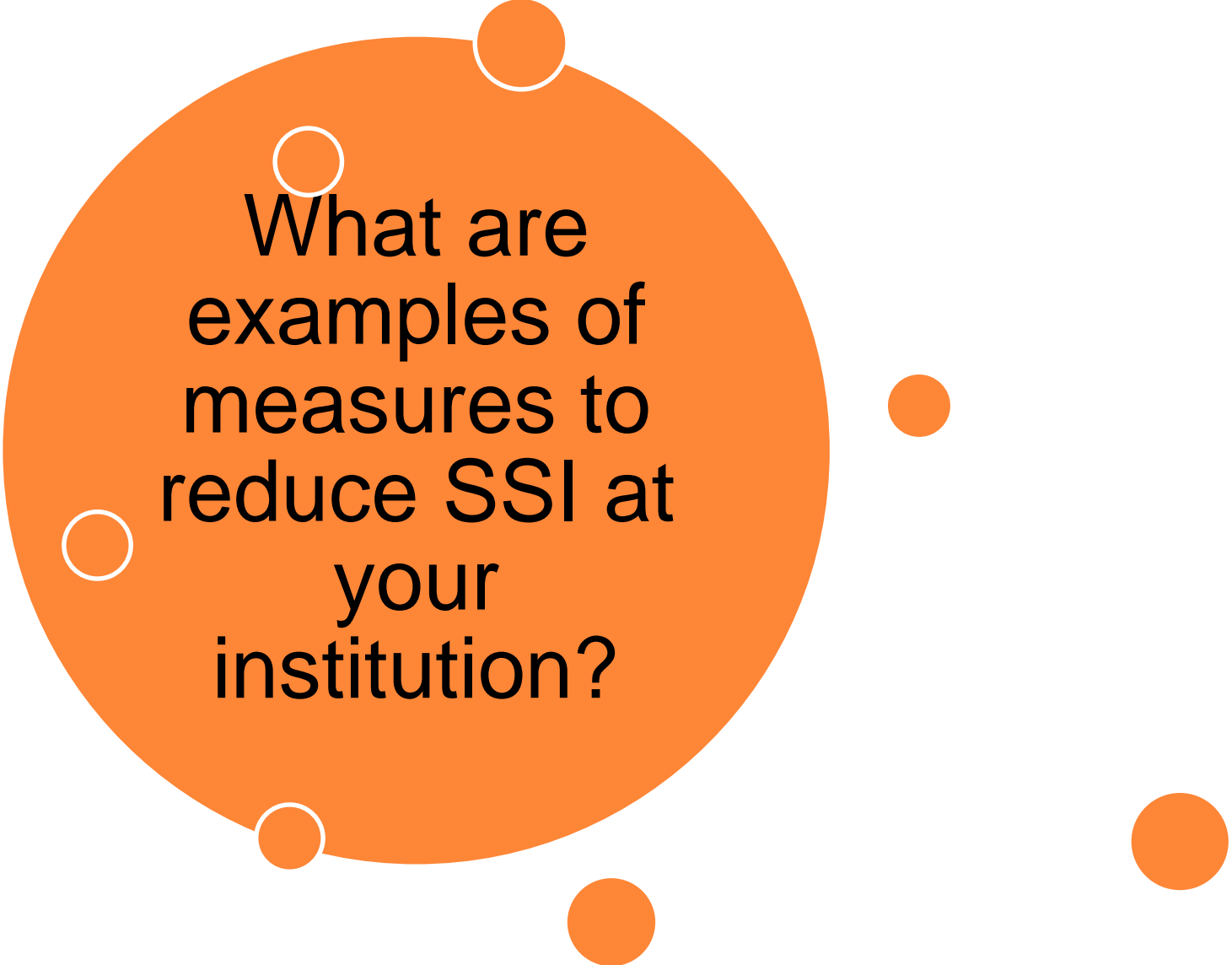


24 additional  
studies

Cardiac, Thoracic,  
ENT, Hepatectomy,  
Oncologic (gastric)

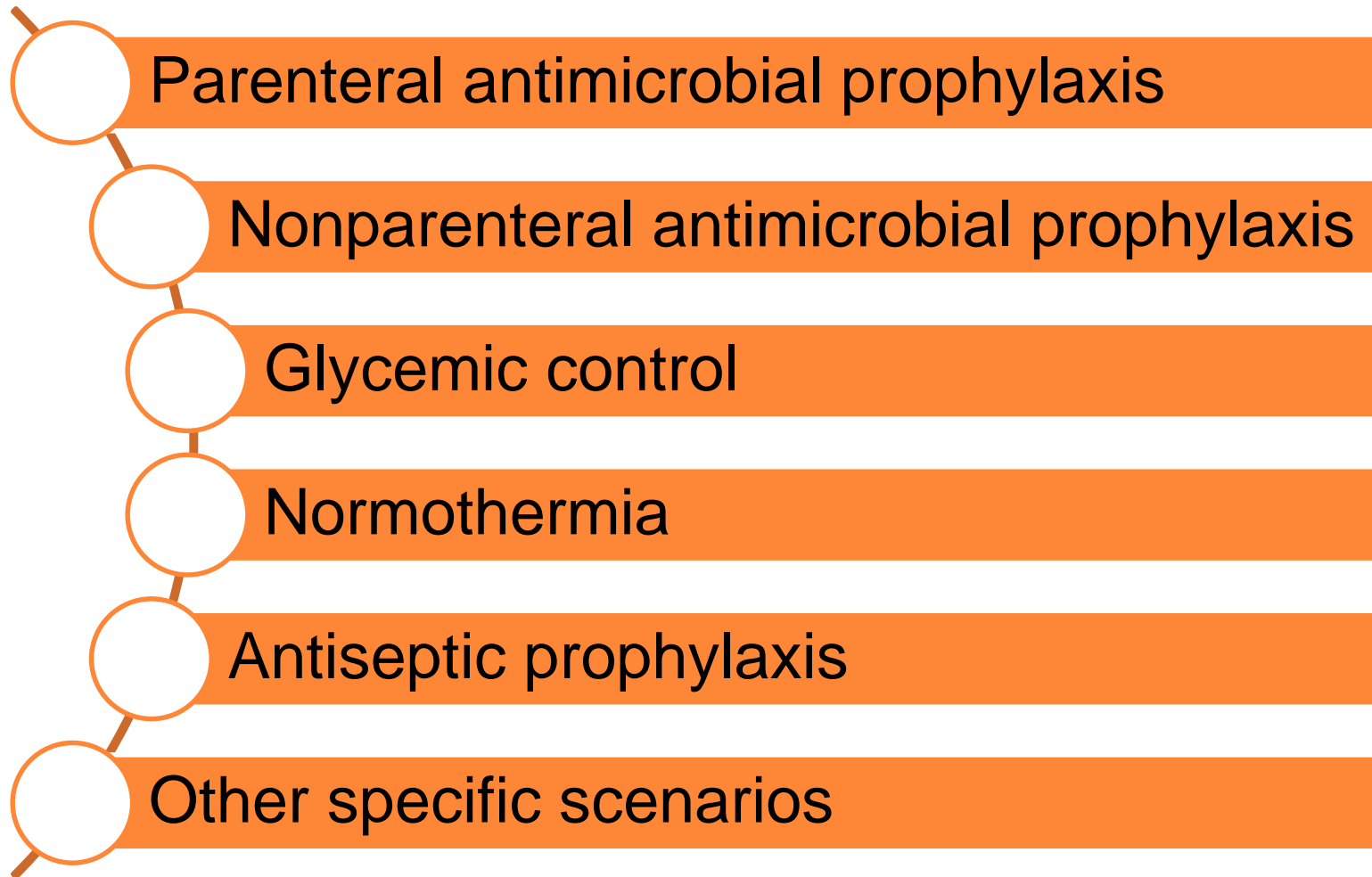
Category 1A, Strong  
recommendation,  
High-quality evidence

# CDC GUIDELINE FOR PREVENTION OF SSI



What are  
examples of  
measures to  
reduce SSI at  
your  
institution?

# CDC GUIDELINE FOR PREVENTION OF SSI



# REFERENCES

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