C. difficile: New Name, New Trends, New Prevention Approaches

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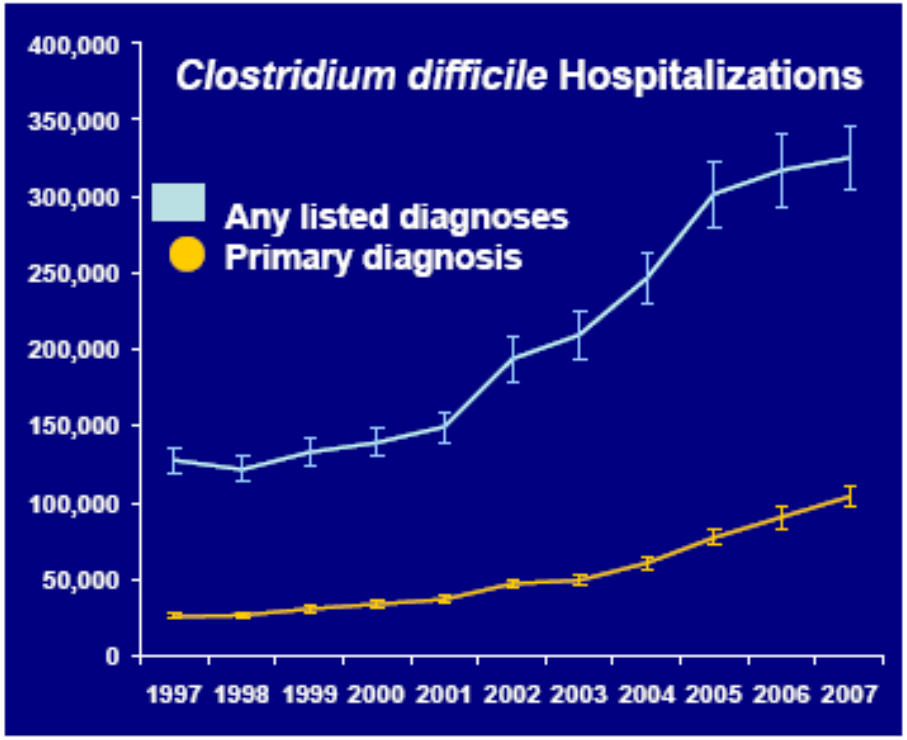
Objectives

- Explore the changing epidemiology of *C. difficile* in hospitals, long term care, and the community
- Describe new approaches toward diagnostic stewardship that include actions of medicine, nursing, environmental services, microbiology, pharmacy, and infection prevention.
- Discuss specific infection and environmental control strategies that have, or will have, important impacts on patient safety

Disclosure

- Funding from Pfizer to study community burden of diarrhea in the Louisville community

Impact of *C. difficile*- Historic



- Hospital-acquired, hospital-onset: 165,000 cases, $1.3 billion in excess costs, and 9,000 deaths annually
- Hospital-acquired, post-discharge (up to 4 weeks): 50,000 cases, $0.3 billion in excess costs, and 3,000 deaths annually
- Nursing home-onset: 263,000 cases, $2.2 billion in excess costs, and 16,500 deaths annually

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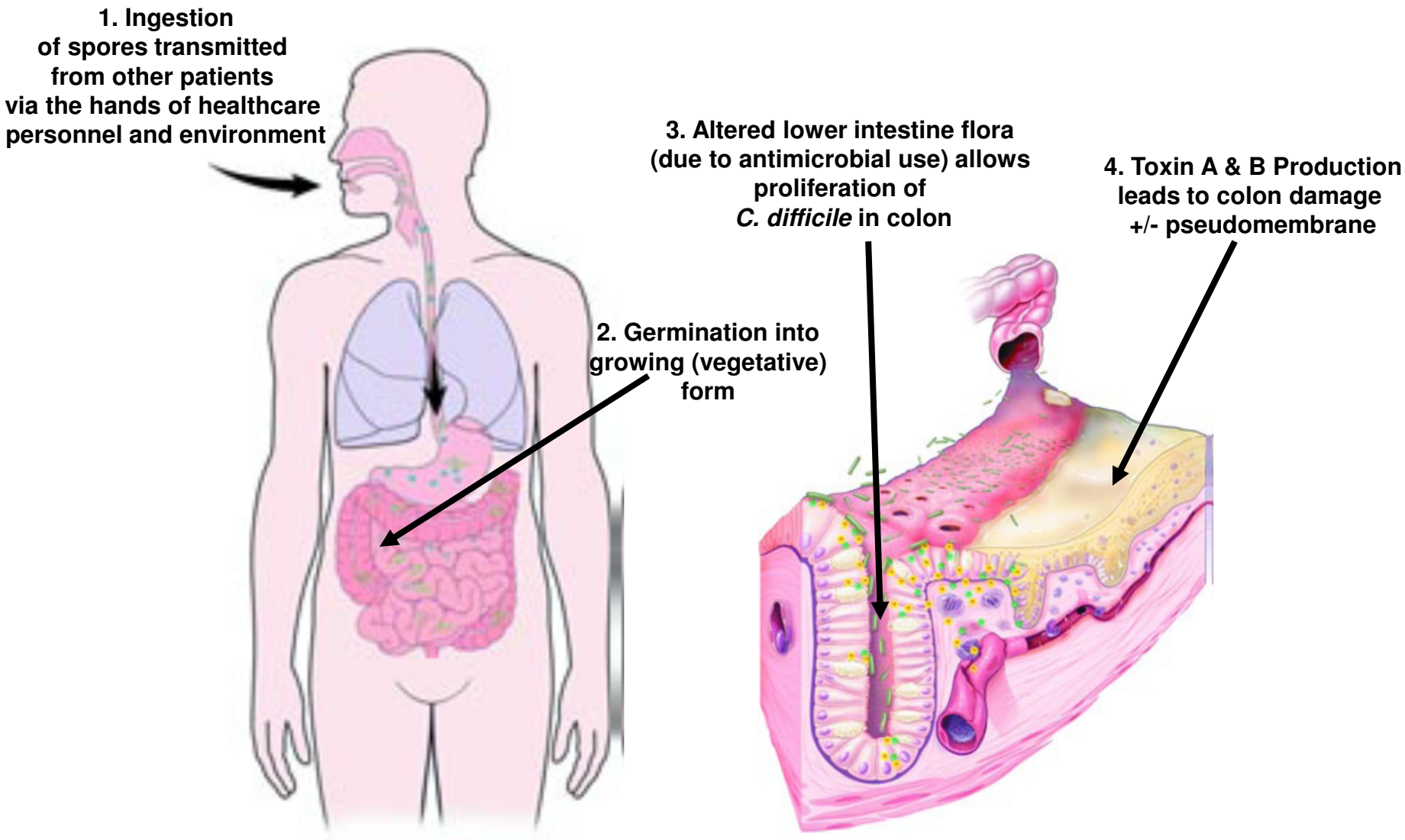
Impact of *C. difficile-The Present*

- *Clostridioides* (*Clostridium*) *difficile* infection (CDI) is the leading cause of health care-associated infections in the US
- Accounts for 15% to 25% of healthcare-associated diarrhea cases in all health care settings, with 453,000 documented cases of CDI and 29,000 deaths in the US in 2015
- Acquisition of *C. difficile* as a health care-associated infection (HAI) is associated with increased morbidity and mortality.
- Significant burden by increasing the length of hospital stay, readmission rates, and cost.
- The cost of hospital-associated CDI ranges from $10,000 to $20,000 per case and $500 million to $1.5 billion per year nationally.

Impact of *C. difficile-The Present*

- Classified by CDC as urgent health threat
- 34% of cases reported through EPI sites were classified as community-onset. Louisville data are similar. Highest rates identified in LTC.
- Healthcare contact has been an historic risk factor, but significant numbers of community-onset/community-associated have no reported contact with healthcare
- Testing for *C. difficile* organism is not exact so differentiating *C. difficile* infection (CDI) from C. difficile organism recognition is challenging

Pathogenesis of CDI



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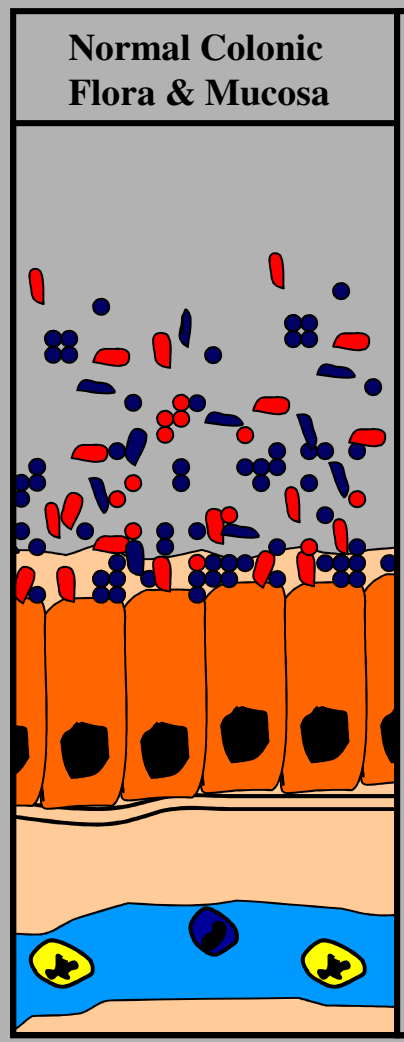
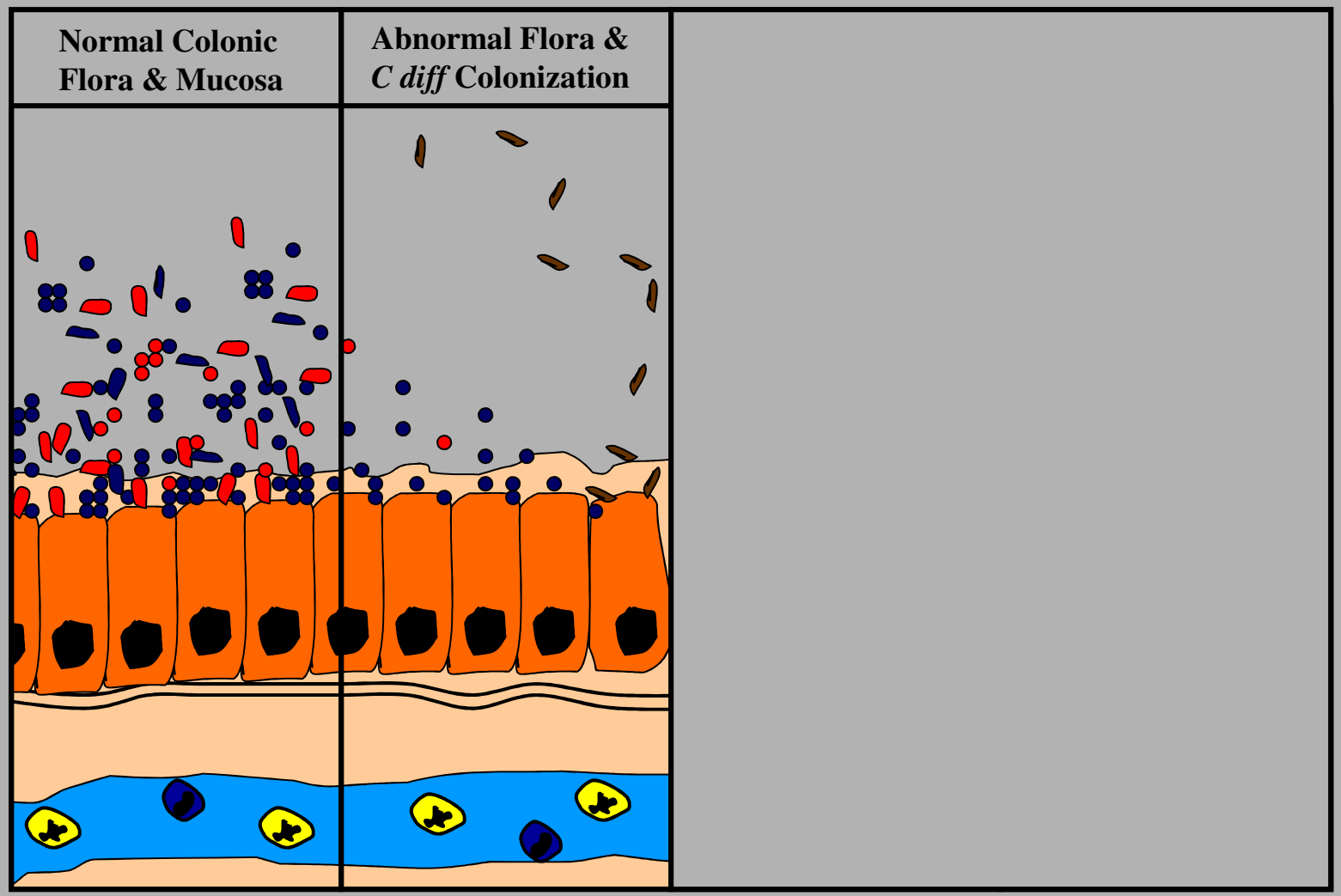
Pathogenesis of CDI



Pathogenesis of CDI



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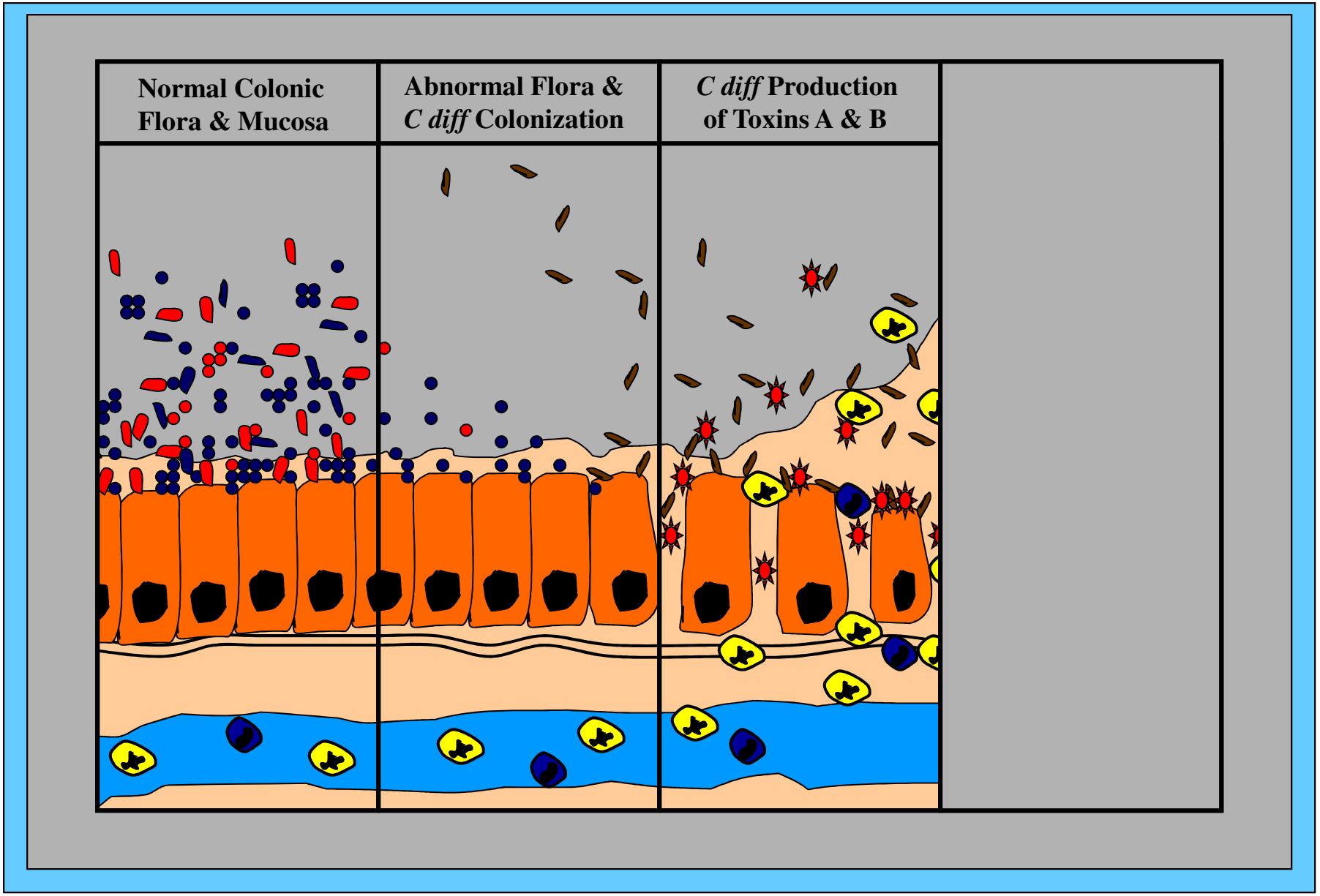

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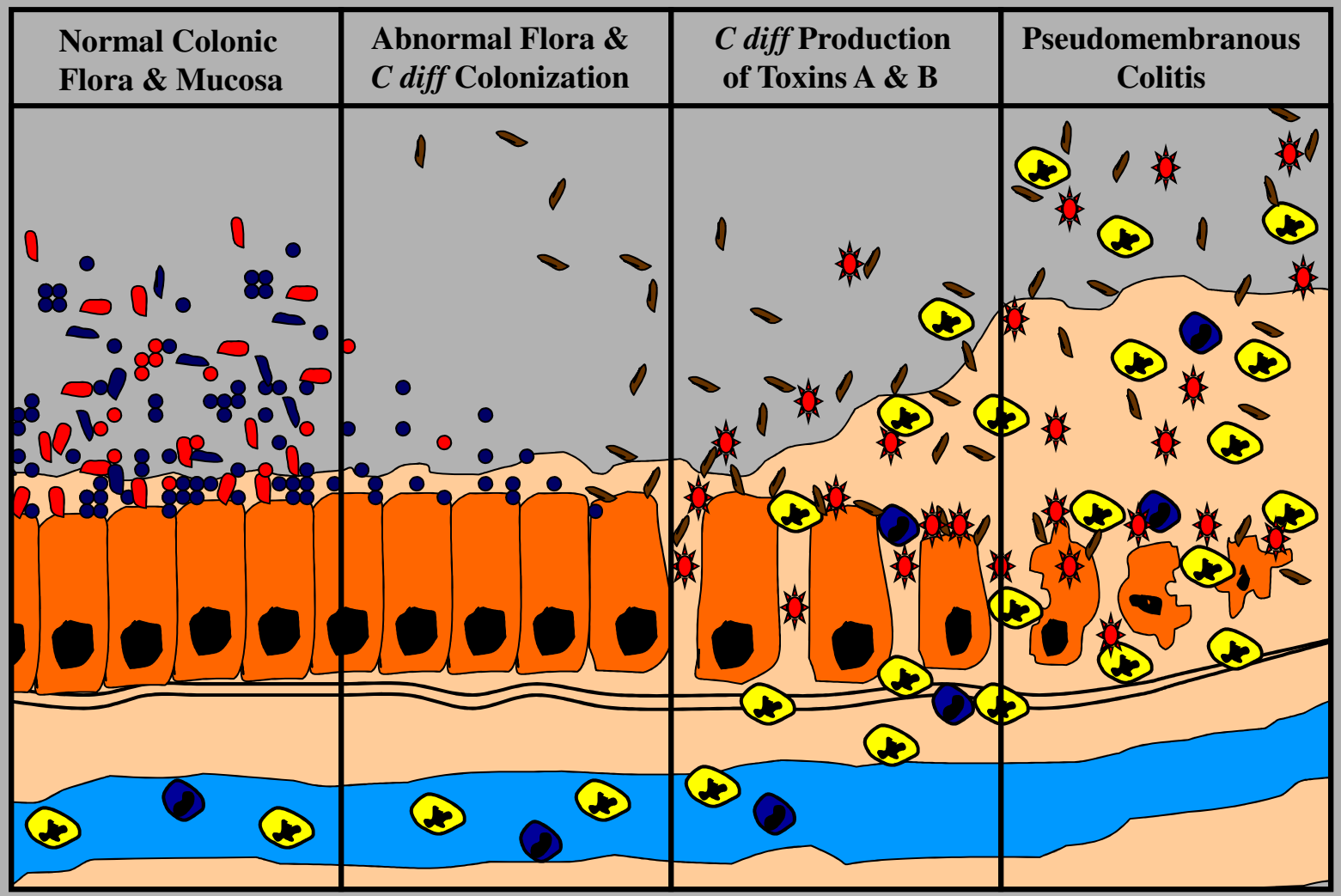
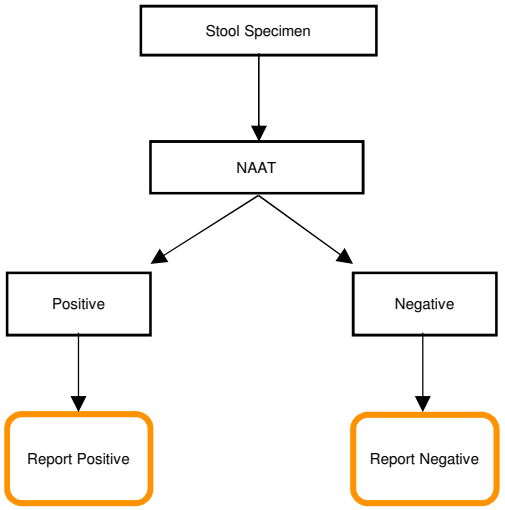


Diagnostic Stewardship

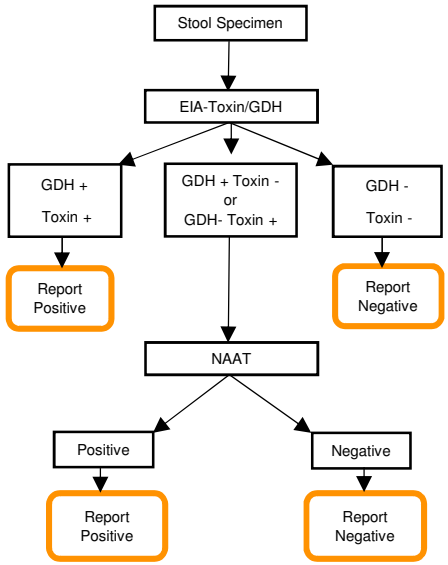
- Presence of *C. difficile* in a stool specimen does not mean CDI is present
- Testing criteria
- Clinical relevance of the results
- Action
- Tension is when to test (*C. difficile* infection) suspected, when not to test (no diarrhea), and what to do when results are negative for CDI is still suspected
- We do not know how often colonization is present nor do we understand the full spectrum of the disease (CDI)
- What impact does nursing documentation play?

C. difficile test algorithms used in Louisville Hospitals

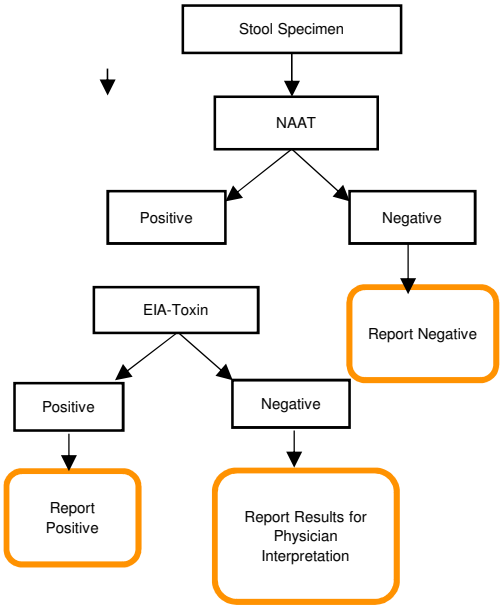
Algorithm 1



Algorithm 2



Algorithm 3



Abbreviations

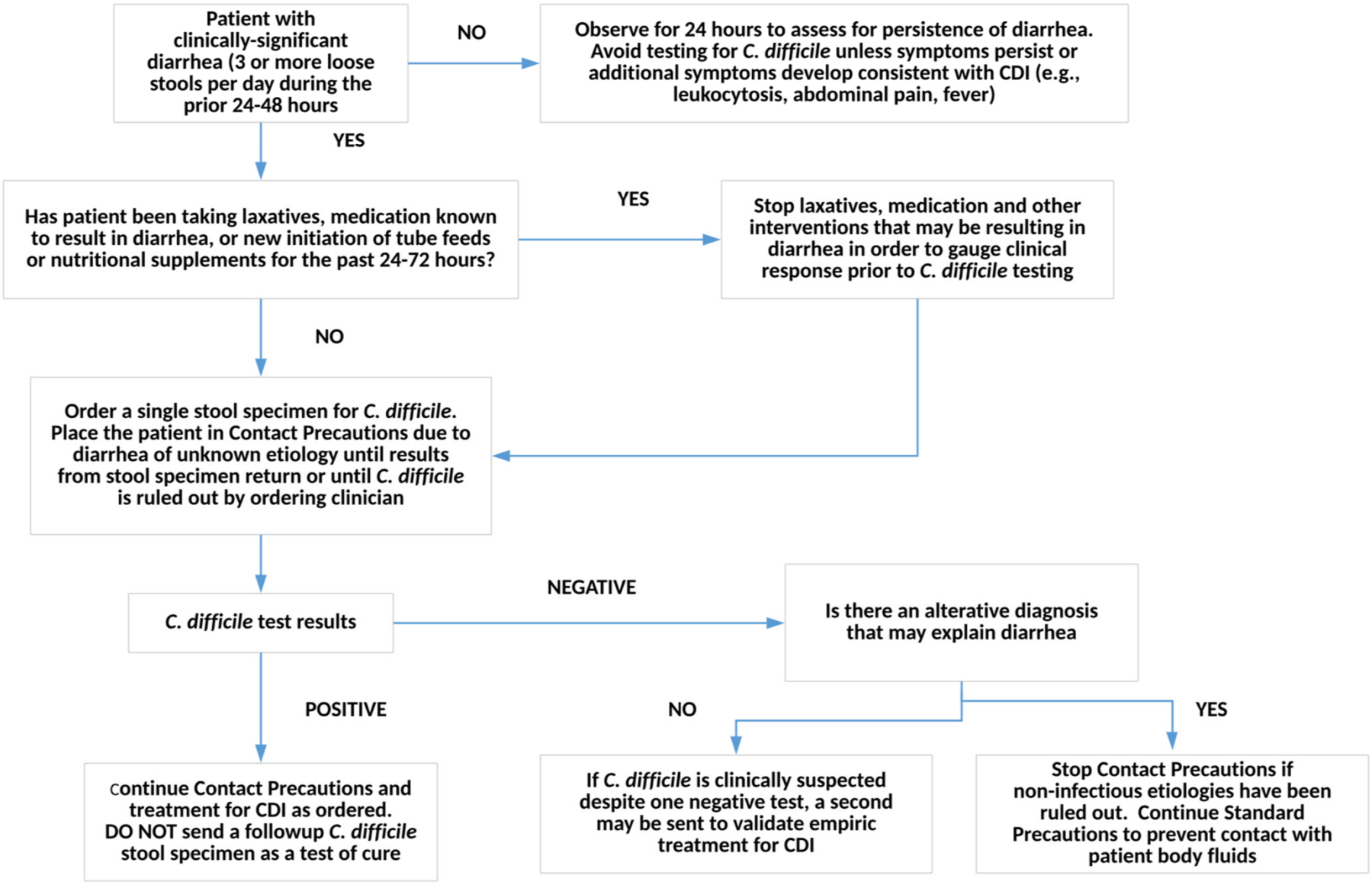
NAAT= Nucleic Acid Amplification Technique

EIA= Enzyme Immunoassay

GDH= Glutamate Dehydrogenase

CDI= *Clostridium difficile* infection

Algorithm for *C. difficile* Testing



Nursing Documentation

- Differences between loose stool event and diarrhea
- How is diarrhea defined?
- How is an individual stool event evaluated?
- Electronic health records may limit documentation options
- Documentation practices (e.g., document once per shift) may fail to capture presence of diarrhea

BRISTOL STOOL CHART

	Type 1	Separate hard lumps	Very constipated
	Type 2	Lumpy and sausage like	Slightly constipated
	Type 3	A sausage shape with cracks in the surface	Normal
	Type 4	Like a smooth, soft sausage or snake	Normal
	Type 5	Soft blobs with clear-cut edges	Lacking fibre
	Type 6	Mushy consistency with ragged edges	Inflammation
	Type 7	Liquid consistency with no solid pieces	Inflammation

Epidemiology: Risk Factors

- Antimicrobial exposure
- Acquisition of *C. difficile*
- Advanced age
- Underlying illness
- Immunosuppression
- Tube feeds
- Gastric acid suppression

What We Do Not Know/Understand

- Incidence of *C. difficile* colonization in the population
- Risk factors for *C. difficile* acquisition in absence of healthcare contact
- Recurrent disease
- Impact of diet on acquisition, development of disease recurrence

What We Do Know

- Fecal-oral transmission of the organism
- Environmental reservoir
- Hand contamination of HCW and/or the patient is transmission opportunity
- Acquisition of the organism may not result in immediate infection. Evidence of C. difficile + may lead to CDI+ at differing times in different patients and population
- Treatment must be confined to those with CDI and not necessarily those CD+

Infection Control and CDI

- Diagnostic Stewardship (to test or not)
- Identification of the organism
- Infection versus presence of the organism without signs/symptoms of infection
- Isolation
- Antimicrobial Stewardship (to treat or not)
- Environmental infection control
- Hand hygiene
- Clear recognition of fecal-oral pathway as part of patient care

Infection Control and CDI

- Diagnostic Stewardship (to test or not)
  - Testing algorithm
    - Flaws
      - Lack of definitions (e.g., what constitutes ‘use of laxatives, how to verify)
      - Presence of CD+ (organism) in patients with diarrhea with history of laxative use. If you do not recognize possibility of both, then you may fail to isolate and even fail to treat appropriately
      - Failure to accurate identify presence of diarrhea
      - Electronic health record system documentation may drive errors just as efficiently as they drive accuracy
      - May drive treatment without testing

Infection Control and CDI

- Infection versus presence of the organism without signs/symptoms of infection
  - Confusion regarding presence of *C.difficile* (the organism) in the absence of symptoms
  - To isolate or not
  - Questions regarding acquisition of the organism and its relationship to future transmission
  - Therefore, there is reason to consider isolation without treatment
    - Prevents unrecognized environmental and hand contamination

Infection Control and CDI

- Infection versus presence of the organism without signs/symptoms of infection
  - If we isolate, are we contributing to ‘isolation fatigue”?
  - How to educate staff at all levels
  - Patient and family education
  - Minimizing environmental contamination
  - Can we introduce an environmental infection control plan that is consistent and impactful for CD+ (organism) and CDI

Infection Control and CDI

- Isolation
  - What are we trying to accomplish with isolation
    - Consistent application
    - Monitoring of adherence
    - Staff feedback
  - Insure isolation practices are consistent and staff are trained

Infection Control and CDI

- Antimicrobial Stewardship (to treat or not)
  - Diagnostic stewardship is critical. Avoiding unnecessary testing (e.g., patient without diarrhea [3 or more liquid stools in 24 hours], not running test for cure following treatment).
  - Accuracy in documentation
  - When treated, make sure it is administered as ordered
  - Educating patient about recurrence
  - Discussion about future antibiotic use

Infection Control and CDI

- Environmental infection control
  - Disinfectant stewardship (5 rights)
    - When to implement use of sporicidal agents
    - Where to use the sporicide (e.g., locations, equipment)
    - How to mix
    - How to apply
    - Contact time
  - New sporicides (e.g., NaDCC/hypochlorous acid)
  - Adjunctive technologies (e.g., UV, self-disinfecting surfaces)

The “Patient”

Recognize that this new ‘patient’ has relevant ‘body systems’

- Respiratory
  - ventilation
- Circulatory
  - water
- Gastrointestinal
  - waste
- Integument/Skin
  - surfaces and equipment

Infection Control and CDI

- Hand hygiene
  - Common sense approach
    - If hands are visibly soiled (or if likelihood) then use soap and water handwash.
    - If patients have CDI, then diarrhea present and opportunity for hand contamination is present
    - Contact with patient should include use of gloves
    - Handwash after glove removal
    - If soap and water not available, then continue with standard practices of using alcohol-based hand rub. If handwash facilities available, use as primary approach.
    - Review with all staff regarding removal of PPE and hand hygiene between each PPE item removal

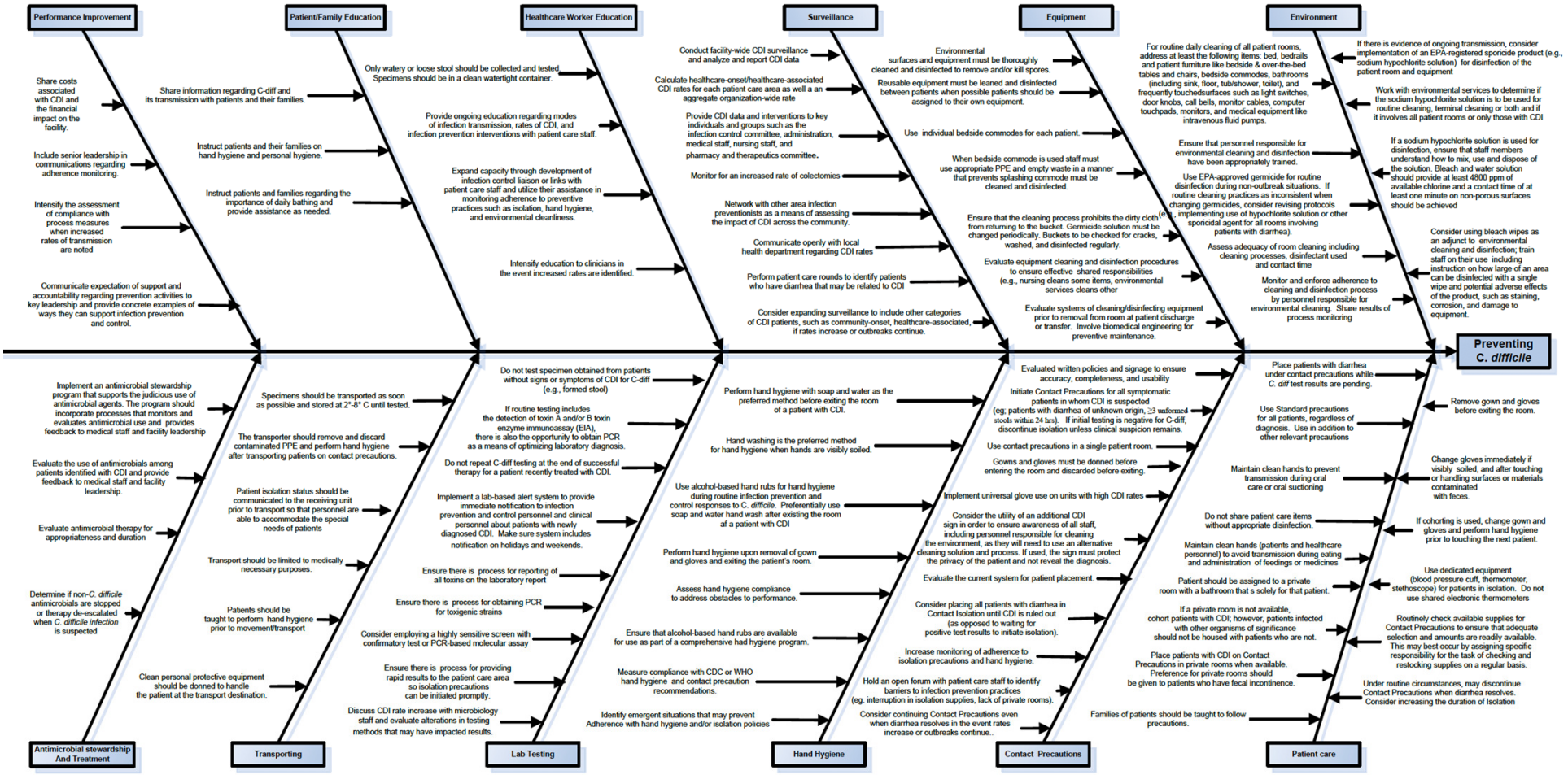
Infection Control and CDI

- Clear recognition of fecal-oral pathway as part of patient care
  - Think about care practices that enable movement of stool/organisms to the patient's mouth
    - Oral medication
    - Patient's environment
    - Oral care
  - Recognize the current research regarding the impact of antibiotics in food
  - Recognize the questions regarding community-onset/community-associated CDI without identified risk factors

Infection Control and CDI

- Continuing to isolate diarrhea of unknown etiology until presumptive diagnosis
- CDI cases: isolate until diarrhea resolution, then consider continuing isolation for 2 or more days due to continued presence of the organism
- Environmental cleaning then disinfection with sporicidal agent (e.g., sodium hypochlorite, hydrogen peroxide, hypochlorous acid)
- Hand hygiene (wash, alcohol-based rub)
- Patient and family education

Preventing Transmission of *Clostridium difficile* in Healthcare Settings



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