HENRY FORD HEALTH®

Antimicrobial Stewardship Strategies Targeting Transitions of Care

Nisha Patel, Pharm.D., BCPS

Clinical Pharmacist – Internal Medicine

Henry Ford Health – Detroit

November 3, 2023

Learning Objectives

At the end of this presentation, participants will be able to:

1. Identify opportunities to improve antimicrobial stewardship (AMS) efforts targeting care transitions.

2. Evaluate evidence to support reducing antibiotic prescribing for asymptomatic bacteriuria.

3. Discuss strategies to improve antibiotic prescribing at hospital discharge.

The speaker has no conflicts of interest to disclose in relation to this presentation

Antimicrobial over use is RAMPANT

55% of all patients in hospitals receive an antibiotic

Estimated 1/3 are not necessary

Antibiotics are prescribed…

39% of urgent care visits

36% of retail clinic visits

13% of ED visits

7% of medical office visits

% for VIRAL respiratory infections

16% urgent care visits

17% retail clinic visits

5% ED visits

6% medical office visits

HENRY FORD HEALTH®

Pew Charitable Trusts, Antibiotic Resistance Project

Antibiotic Stewardship Core Elements

Core Elements of Hospital Antibiotic Stewardship, CDC, 2019

Antimicrobial Stewardship Programs (ASP)

System to improve antibiotic use, comprised of multidisciplinary personnel, information technology, diagnostics, interventions, tracking, reporting, and education

Mission

Improve patient outcomes through optimization of antimicrobial therapy and to support the education of healthcare providers in appropriate antimicrobial use

Goals

- Improve patient outcomes
- Improve patient safety
- Reduce antibiotic overuse
- Cost Effective Care

Every Day Matters

9%

- 9% increased risk of *C. difficile* per day in patients receiving antibiotics for pneumonia

4%

- 4% increased risk of *P. aeruginosa* resistance to meropenem, pip/tazo, or cefepime for each day of therapy

3%

- Every 10 days of antibiotics is associated with a 3% increased risk of serious ADE

HENRY FORD HEALTH®

Chalmers JD, et al. *J Infect* 2016; 73(1):45-53.
Teshome BF, et al. *Pharmacotherapy* 2019: 39(3):261-70.
Tamma P et al. *JAMA Intern Med*. 2017;177(9):1308-1315.

Patient Case AB

AB is a 79-year-old male with uncontrolled type 2 diabetes on insulin, recurrent diabetic foot infections, and peripheral artery disease on rivaroxaban and aspirin, who presents to the ED by his family due to seeming more confused and tired than his baseline. He has no other symptoms. His labs and vitals are obtained and listed below.

VITALS	
BP	112/66 mmHg
HR	66 bpm
Temperature	98.6°

PERTINENT LABS	
WBC	9.7 K/µL
Hgb	13.5 g/dL
Na	137 mmol/L
SCr	0.9 mg/dL
BGL	46 mg/dL

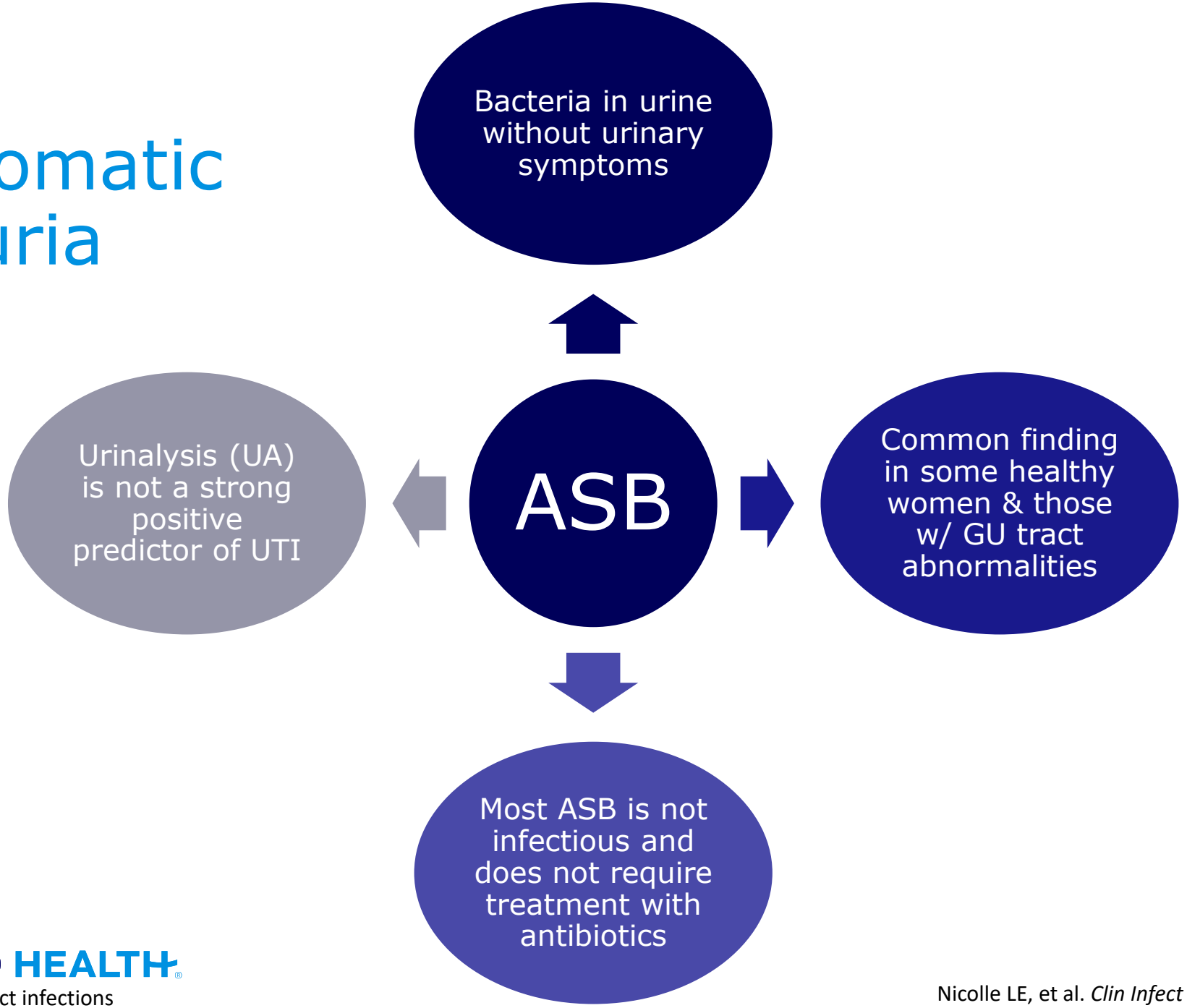
URINALYSIS	
Leukocyte Esterase	Large
Nitrite	Positive
WBC	78 cells/mL
Squamous epithelial cells	2-3
Bacteria	Rare

Patient Case AB Treatment

The ED medical resident calls you and asks what treatment they should start for a suspected UTI. What would your recommendation be for AB?

A. Ceftriaxone IV for a urinary tract infection
B. Vancomycin and cefepime for possible sepsis
C. Hold antibiotics and consider Andexxa alfa for a possible bleed
D. Hold antibiotics and IV dextrose for hypoglycemia

What is Asymptomatic Bacteriuria (ASB)?

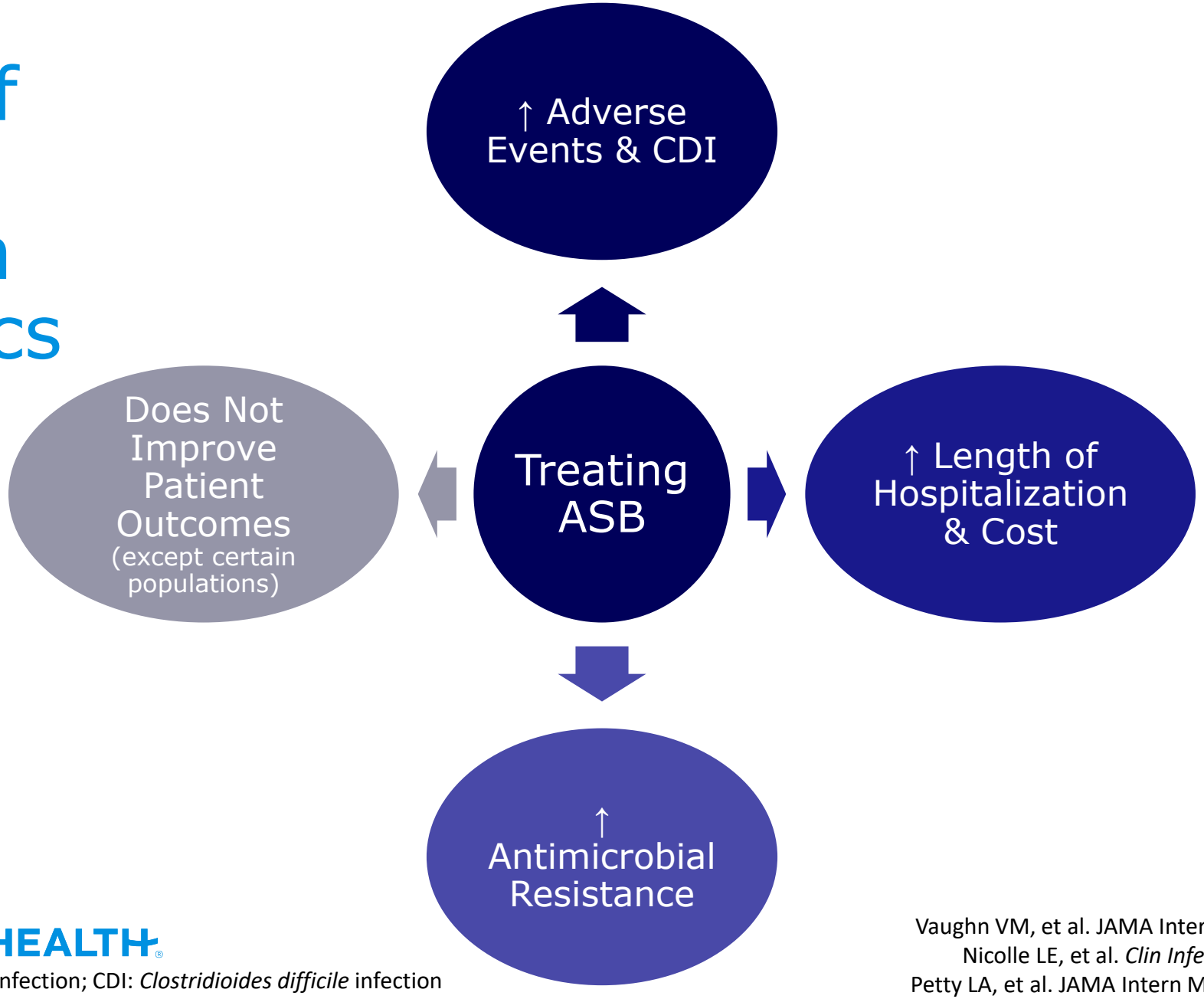


HENRY FORD HEALTH®

GU: genitourinary; UTI: urinary tract infections

Nicolle LE, et al. *Clin Infect Dis.* 2019;68(10):e83-e110.

Harms of Treating ASB with Antibiotics



HENRY FORD HEALTH®

GU: genitourinary; UTI: urinary tract infection; CDI: *Clostridioides difficile* infection

Vaughn VM, et al. JAMA Intern Med. 2023;183(9):933-941.
Nicolle LE, et al. *Clin Infect Dis.* 2019;68(10):e83-e110.
Petty LA, et al. JAMA Intern Med. 2019;179(11):1519-1527.

Antimicrobial Overuse for ASB in the Emergency Department (ED)

Testing → Treatment

43 hospitals in the Michigan Hospital Medicine Safety Consortium (HMS)

N = 2,461 patients in ED w/ ASB, 74.4% received antibiotics

UC ordered in 80% of patients (most common reason: abnormal UA; others: AMS, spinal cord injury, dementia, urinary catheter) & initiated tx in 68.5% (n=1253)

Once initiated, 79% remained on antibiotics for ≥ 3 days.
Most common discharge antibiotic = ciprofloxacin

Antibiotic treatment →

- Longer length of stay (5.1 vs 4.2 days; relative risk = 1.16; 95% CI, 1.08–1.23)
- CDI more common: 0.9% vs 0%; P = .02

HENRY FORD HEALTH

UC: urine culture; UA: urinalysis; AMS: altered mental status

Petty LA, et al. *Open Forum Infect Dis.* 2020;7(12):ofaa537.

Strategies to Reduce Treatment for ASB

Antibiotic Stewardship Strategies

Education

- Education of symptoms, ASB treatment, & an algorithm in the ED: ↓ in patients treated for ASB: 39.6% vs. 23.1% (p=0.004) post intervention in a study by James, et al.

Audit and Feedback

Optimization of the Electronic Health Record

Antibiotic Restriction (i.e. fluoroquinolone)

Updated Institutional Treatment Guidelines

HENRY FORD HEALTH®

James D, et al. Am J Health-Syst Pharm. 2019;76(suppl 2):S41-8.
Vaughn VM, et al. JAMA Intern Med. 2023;183(9):933-941.
Advani S, et al. *Curr Infect Dis Rep*. 2021;23(10):16.

Strategies to Reduce Treatment for ASB

Diagnostic Stewardship Strategies

- Audit and Feedback
- Education
- Remove/Change urine culture testing from order sets (ED, pre-surgical, admission)
- Hide/Change urine culture result reporting
  - Hiding positive urine culture results from clinicians reduced antibiotic initiation for ASB from 48% to 12% (P=0.002) in a study by Leis, et al.
  - Urine culture report including a laboratory nudge discouraging treatment of ASB improved optimal treatment from 29 of 55 (52.7%) vs. 44 of 55 (80.0%) (P=0.002), by Daley et al.
- Add/Remove reflex testing
- Optimization of Electronic Health Record

Vaughn VM, et al. JAMA Intern Med. 2023;183(9):933-941.
Daley P. Infect Control Hosp Epidemiol. 2018; 39(7):814-819
Leis JA. Clin Infect Dis. 2014;58(7):980–3.
Advani S, et al. *Curr Infect Dis Rep*. 2021;23(10):16.

Strategies to Reduce Treatment for ASB

Multi-faceted Approach

Cash MC, et al. *Antimicrob Steward Healthc Epidemiol.* 2022

- **Intervention**: Verbal presentation to physicians and pharmacists, pocket card and treatment algorithm creation and distribution, alerts embedded into the EHR when ordering urine cultures, and elimination of reflex urine culture order
- **Results**: Significant reduction in inappropriate prescribing for ASB (100% vs. 32.4% vs. 28%, $p<0.001$)

MacLaggan TD, et al. *Infect Control Hosp Epidemiol.* 2019

- **Intervention**: Nursing and prescriber education, modification of positive urine culture reporting, pharmacist-led prospective audit-and-feedback
- **Results**: 50.8% reduction in ASB treatment (67.3% vs. 16.5%)

HENRY FORD HEALTH®

Cash MC, et al. *Antimicrob Steward Healthc Epidemiol*. 2022;2(1):e148.
MacLaggan TD, et al. *Infect Control Hosp Epidemiol*. 2019;40(1):72-78.

Back to Patient Case AB

Question 2: AB is given IV dextrose, started on IV ceftriaxone for urinary tract infection, and admitted to the floor. What is a possible consequence of starting IV ceftriaxone in the ED?

A. AB will develop *Clostridium difficile.*
B. AB will be discharged with a 10-14 day course of antibiotics.
C. AB will develop resistance to ceftriaxone.
D. All of the above.

Uncomplicated Urinary Tract Infections: Short Course Beta-Lactams

Open-label, multicenter, RCT evaluating antibiotic duration for the treatment of uncomplicated UTI (uUTI) in women

3 days of cefpodoxime 100 mg PO BID (n=63)

3 days of TMP/SMX 1 DS PO BID (n=70)

Results: 3-day course of cefpodoxime is as safe and effective as a 3- day course of TMP/SMX for the treatment of uUTI in women

HENRY FORD HEALTH®

Kavatha D et al. Antimicrob Agents Chemother. 2003; 47(3):897-900.

Uncomplicated Urinary Tract Infections: Three Days of Ceftriaxone

Retrospective cohort study evaluating antibiotic duration for the treatment of uncomplicated UTI (uUTI) in both men and women

3 days of ceftriaxone (n=51)

Longer duration of therapy, median 6 days (n=49)

Results: 3-day course of ceftriaxone is as safe and effective as a longer duration for the treatment of uUTI

HENRY FORD HEALTH®

Balsam E, et al. *Antimicrobial Stewardship & Healthcare Epidemiology*. (2022)2:e171,1–4.

Urinary Tract Infections in Males: Duration of Therapy

Retrospective cohort evaluating the correlation between duration of antibiotic therapy and UTI recurrence in males

457 males without complicating factors:

- 50.9% prescribed ≤ 7 days
- 49.1% prescribed >7 days

No difference in UTI recurrence in males treated for ≤ 7 days vs. >7 days

HENRY FORD HEALTH®

Germanos GJ et al. Open Forum Infect Dis. 2019; 6(6):ofz216.

Urinary Tract Infections in Males: Duration of Therapy

Randomized, double-blind, placebo-controlled noninferiority trial

Compared 7 days of TMP/SMX or ciprofloxacin to 14 days for treatment of UTI in afebrile men

Primary endpoint: symptom resolution 14 days after completing active therapy

7 days noninferior to 14 days for uncomplicated UTI in males

HENRY FORD HEALTH®

Drekonia DM. et al. *JAMA*. 2021; 326(4):324-331.

But are All Men Really… Complicated?

Old Definitions:

2011 IDSA Guidelines

Uncomplicated UTI:

- Acute cystitis in a healthy nonpregnant afebrile woman w/ no diabetes or urologic abnormalities

Acute Pyelonephritis

Complicated UTI:

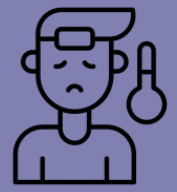
- Everything else

New Definitions:

2023 IDSA Guidelines Being Updated

Complicated UTI: infection beyond the bladder

- Pyelonephritis
- CAUTI
- Febrile or bacteremic UTI



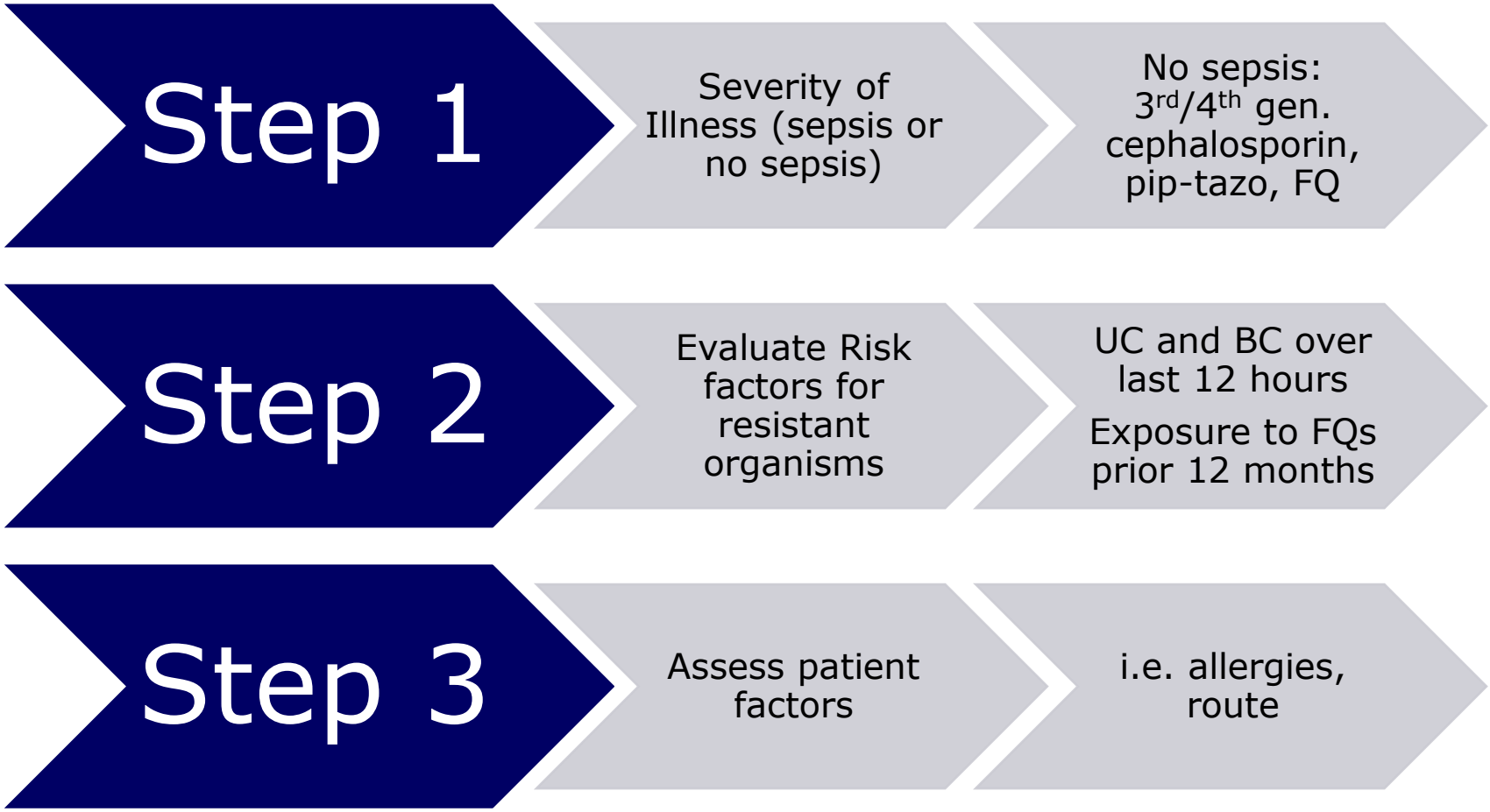
Uncomplicated UTI:

- Everything else (women or men)

HENRY FORD HEALTH®

IDSA 2023. ID week. 2023 Oct.

New Definition of cUTI: Empiric Therapy



HENRY FORD HEALTH®

IDSA 2023. ID week. 2023 Oct.

New Definition of cUTI: Duration of Therapy

Consider **7 days of therapy** for patients with pyelonephritis, gram negative bacteremia 2/2 UTI with prompt clinical response, complicated UTI for women (all) and men without prostatitis

HENRY FORD HEALTH®

IDSA 2023. ID week. 2023 Oct.

Back to Patient Case AB

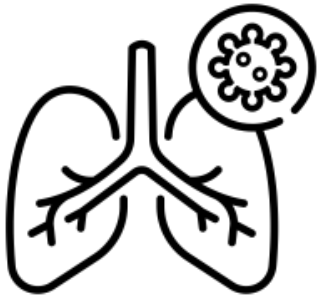
Question 3: AB improves after a day on the floor and the primary team is adamant about discharging him with antibiotics to finish the course for a UTI. What would be your recommendation for an optimal total duration of therapy?

A. 3 days of cefpodoxime for an complicated UTI
B. 3-5 days of sulfamethoxazole-trimethoprim for an uncomplicated UTI
C. 10-14 days of cefpodoxime for a complicated UTI
D. 7 days of ciprofloxacin for a complicated UTI

Antibiotic Overuse at Hospital Discharge

- Less than 1 in 5 hospitals with antimicrobial stewardship programs monitor antibiotic use after discharge
- In a study of 21,825 patients treated for infection:

49.1%
Antibiotic overuse after discharge



63.1%
Overuse in pneumonia due to excess antibiotic duration

34.2%
Prescribed fluoroquinolones at discharge

HENRY FORD HEALTH®

Vaughn et al. *Clin Infect Dis.* 2021;73:e4499–e4506.

Strategies to Target Prescribing at Hospital Discharge

Purpose

Evaluated a pharmacist-driven intervention to improve selection and duration of oral antibiotics at discharge

Primary Outcome

Frequency of optimized antimicrobial prescription

Method

Non-randomized stepped wedge design

9/1/2018 – 8/21/2019

Population

Adults with uncomplicated infections

+

Prescribed antibiotics at discharge

Intervention

Pharmacist direct engagement in antimicrobial stewardship program transitions of care process

(ASP TOC)

HENRY FORD HEALTH®

Mercuro et al. *JAMA Network Open.* 2022;5(5):e2211331
Patel et al. *J Am Coll Clin Pharm*. 2022; 5:632-643

Antimicrobial Stewardship Program Transition of Care (ASP TOC)

ASP TOC Intervention Steps	
Who?	• Academic Model: all pharmacists practicing on general medical wards • Community Model: AMS Pharmacist leads intervention
Identify Patients	• EHR column of anticipated discharge, discussion during teaching rounds and/or progressive rounds
Communicate & Collaborate	• Pharmacist discusses plan during rounds or calls/messages provider
Order & Document	• Pharmacist enters discharge prescription order in EHR, co-signed by physician • Pharmacist writes ASP TOC EHR progress note

HENRY FORD HEALTH®

EHR: electronic health record

Key Steps in Intervention Implementation

- Stakeholder Discussion
- Workflow Plan for Pharmacists
- Institutional Guideline Support for Pharmacists
- Educational Overview for Physicians, Nurses
- Electronic Templates for Documentation
- Metrics for Success

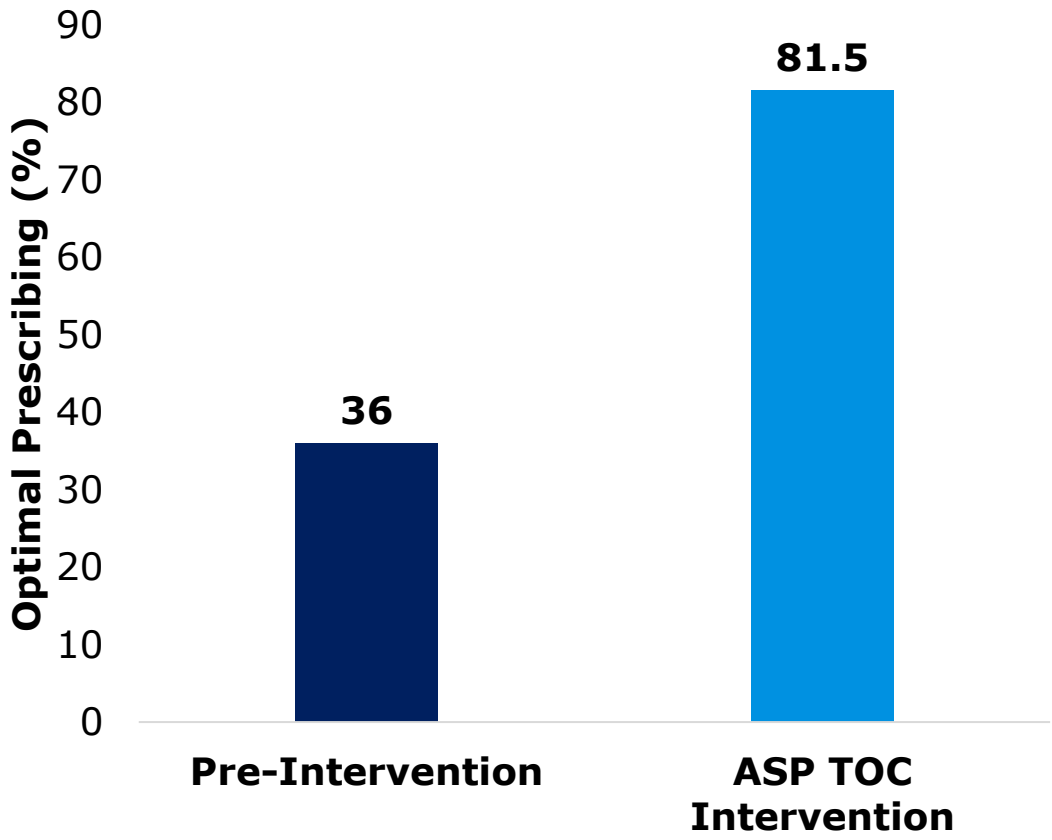
	Disease state	Regimen and dosage	Total Duration
Respiratory Infections	Community-acquired pneumonia (without microbiologic data)	• Amox/clav 1000/62.5 mg 2 tabs BID + azithro 500 mg daily or doxy 100 mg BID • Amoxicillin 1000 mg TID + azithro 500 mg daily or doxy 100 mg BID • Cefpodoxime 400 mg BID + azithro 500 mg daily or doxy 100 mg BID • Beta-lactam allergy: Moxifloxacin 400 mg or levofloxacin 750 mg daily	5 days (prompt clinical response) 7 days (structural lung disease or delayed response)
	Acute Exacerbation of COPD (AECOPD)	• Doxycycline 100 mg BID (preferred) • Azithromycin 500 mg or 250 mg	5 days
	Hospital acquired pneumonia (without microbiological data)	• Moxifloxacin 400 mg OR levofloxacin 750 mg daily	7 days without clinical response: tailor therapy to microbiologic data
Urinary Tract Infections	Uncomplicated UTI/cystitis (align with organism susceptibility)	• Nitrofurantoin (NFT) 100 mg BID • Sulfamethoxazole-trimethoprim (SMT) 1 DS tab BID • Beta-lactam (targeted to organism) • Fosfomycin 3 gm oral sachet (if ESBL history)	NFT: 5 days SMT: 3 days BL: 3-7 days Fosfomycin: 1-2 doses
	Complicated UTI/ pyelonephritis (align with organism susceptibility)	• SMT 1-2 DS tab BID • Ciprofloxacin 500 mg BID • Beta-lactam (targeted to organism)	SMT : 7 days Fluoroquinolones: 7 days BL: 7 days
	Asymptomatic bacteriuria	• Do not treat unless pregnant or urologic procedure	0 days
SSTI	Non-purulent cellulitis	• Cephalexin 500 mg QID, cefuroxime 500 mg BID • Dicloxacillin 500 mg QID • Severe BL allergy: Clindamycin 300-450 mg TID	5 days with prompt clinical response
	Purulent cellulitis/ cutaneous abscess	• Doxycycline 100 mg BID • SMT 1-2 DS BID	5 days with prompt clinical response
IAI	Spontaneous bacterial peritonitis	• Moxifloxacin 400 mg daily or levofloxacin 750 mg daily	5 days
	Complicated, community acquired intra-abdominal infection with source control	• Moxifloxacin 400 mg daily • Ciprofloxacin 500 mg BID + metronidazole 500 mg BID/TID • Cefuroxime 500 mg BID + metronidazole 500 mg BID/TID • Amoxicillin/clavulanate 875/125 mg BID	4-7 days after source control

ASP TOC Outcomes: Improved Discharge Prescribing

Result

↑ Optimal antibiotic prescribing at discharge from

36% to 81.5%



HENRY FORD HEALTH®

Mercuro et al. JAMA Network Open. 2022;5(5):e2211331

Overall Results

Pharmacists collaborating and pending the discharge order increased appropriate discharge antibiotic regimens by 46%

Reduces antibiotic harm

Improves patient outcomes

HENRY FORD HEALTH®

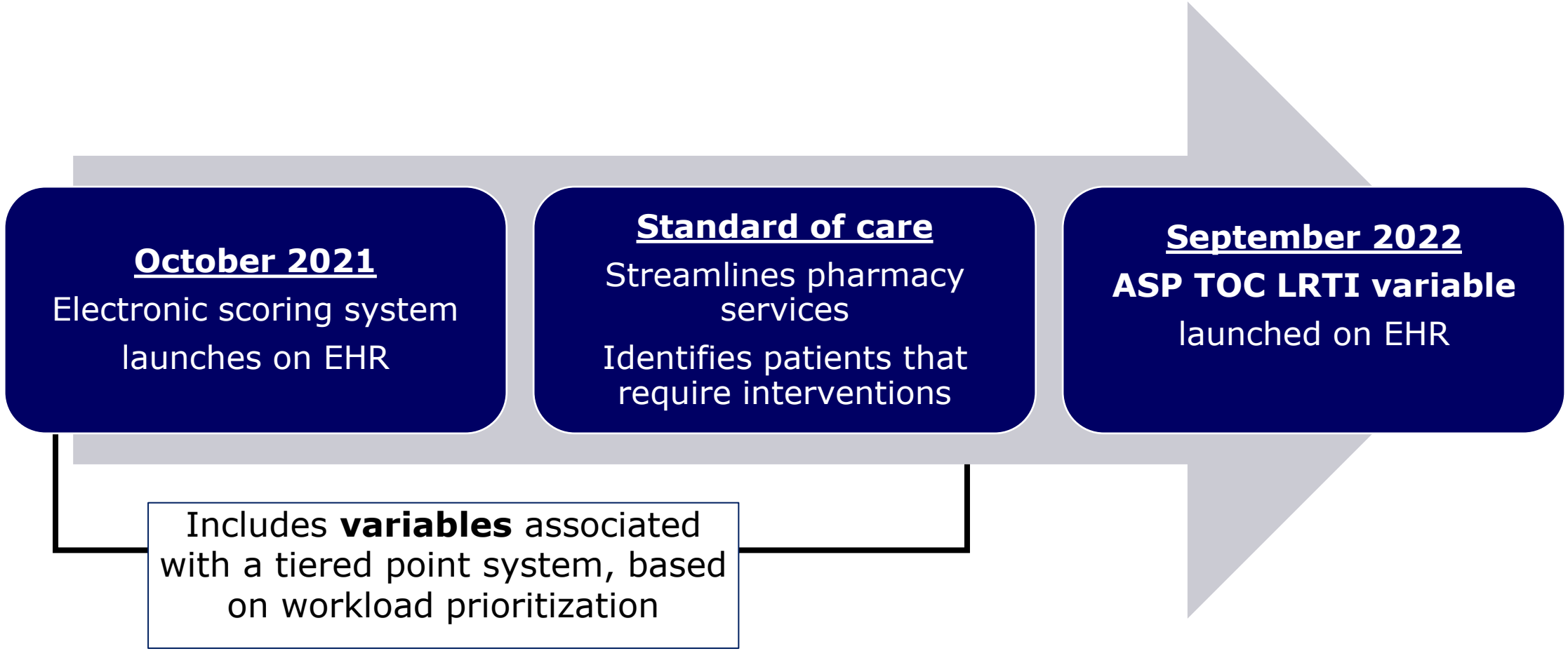
Mercuro et al. JAMA Network Open. 2022;5(5):e2211331

Limitations of Completing the ASP TOC Intervention Identified

- Inconsistent methods in identifying patients eligible for interventions
- Weekend or “off-hours” staffing
- Inaccurate “anticipated discharge dates” on EHR

Patel et al. *J Am Coll Clin Pharm*. 2022; 5:632-643

Addressing the Limitation: Using an Electronic Scoring System

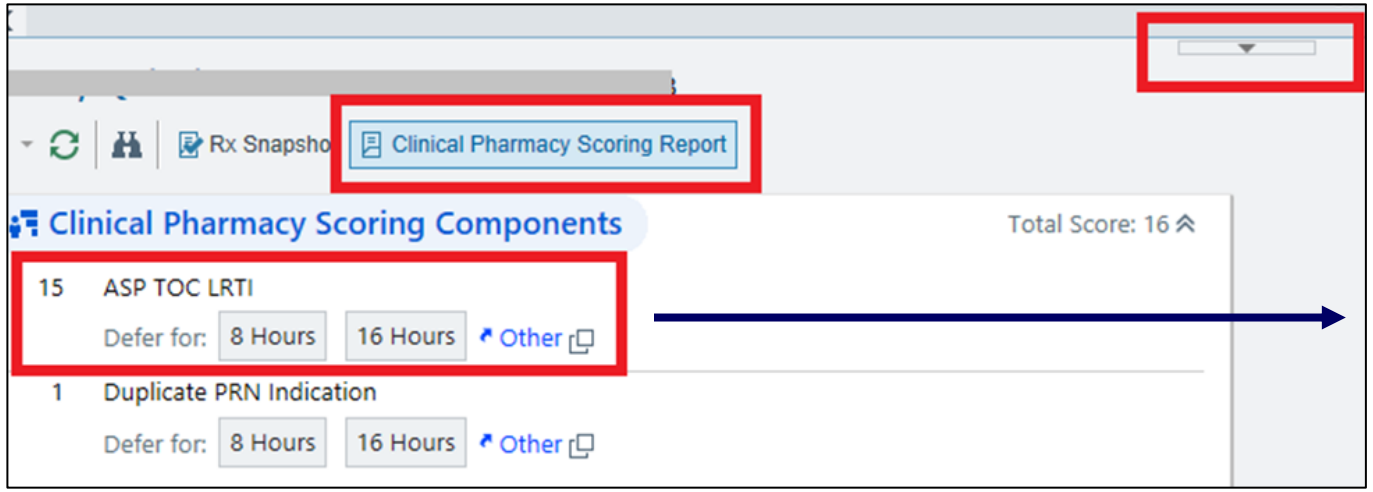


HENRY FORD HEALTH

LRTI: Lower respiratory tract infection

Belza AC, et al. ID week poster abstract 1201. 2023 Oct.

Electronic Scoring System: ASP TOC LRTI Variable



ASP TOC LRTI Variable

Antibiotics

ceftriaxone, doxycycline, azithromycin, ampicillin-sulbactam, moxifloxacin

Antibiotics > 48 hours

Indication

Lower Respiratory Tract Infection

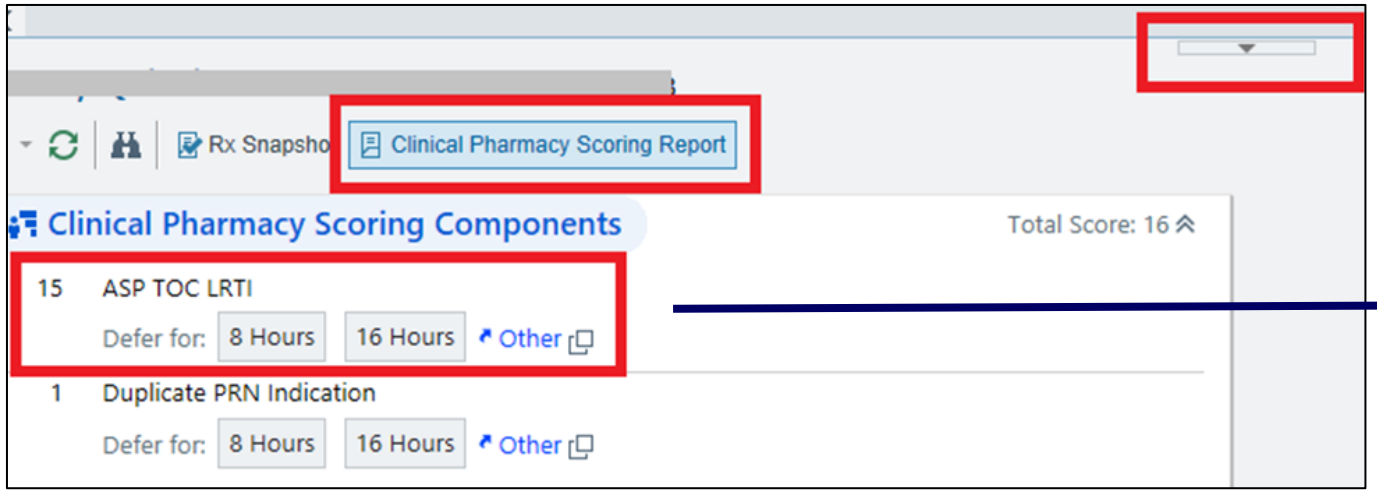
LRTI → CAP → COPD

HENRY FORD HEALTH

CAP: Community-acquired pneumonia ; COPD: Chronic obstructive pulmonary disease

Belza AC, et al. ID week poster abstract 1201. 2023 Oct.

Steps to Use the ASP TOC Variable



Identify patients eligible for ASP TOC interventions

Pharmacist completes ASP TOC Intervention

1) Finalize discharge antibiotic regimen with primary team

2) Write ASP TOC Progress Note

3) Write antibiotic discharge prescription order

HENRY FORD HEALTH®

Belza AC, et al. ID week poster abstract 1201. 2023 Oct.

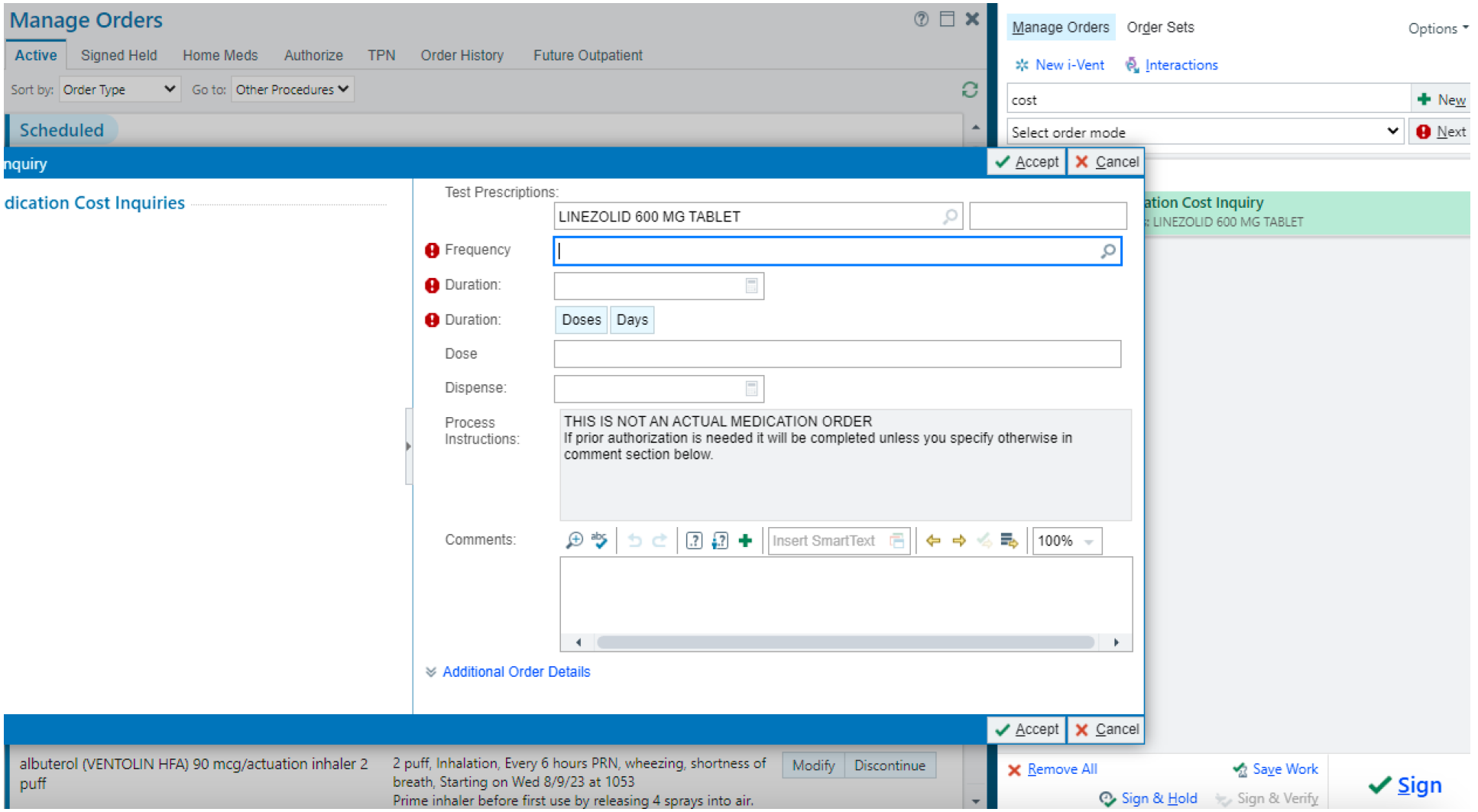
Results of Using the ASP TOC Variable

Endpoint	Pre-Intervention N = 100	Post-Intervention N = 100	P-value
Primary Endpoint			
Proportion with optimized discharge regimen (n, %)	69 (69)	82 (82)	0.033
Secondary Endpoint			
Proportion of ASP TOC interventions completed (n, %)	4 (4)	25 (25)	< 0.001
Adverse effects	5 (5)	3 (3)	0.0721
Emergency department visits	29 (29)	21 (21)	0.191
Readmission	21 (21)	14 (14)	0.193
Primary care physician clinic visits	1 (1)	2 (2)	0.561
Length of stay (days, IQR)	3.79 (2.9-4.9)	3.73 (2.7-4.6)	0.839

HENRY FORD HEALTH®

Belza AC, et al. ID week poster abstract 1201. 2023 Oct.

Checking Discharge Medication Access Using an Electronic System



HENRY FORD HEALTH®

Griebe KM, et al. Am J Health-Syst Pharm. 2022;79:477-485

Discharge Medication Access Breakdown

DMCI Consult Order Result	Number, n (%)
Covered	849 (60.8)
Prior auth required	174 (12.4)
Not covered	124 (8.9)
No insurance	71 (5.1)
Deductible not met	48 (3.4)
Other*	131 (9.4)

Medication Class	Number, n (%)
Anticoagulant	2245 (55.7)
Respiratory Inhaler	602 (14.9)
Antimicrobial	**428 (10.6)**
Antidiabetic	220 (5.4)
Antiplatelet	143 (3.6)
Antihypertensive	87 (2.2)
Analgesic	58 (1.4)
Cardiac	47 (1.2)

Griebe KM, et al. Am J Health-Syst Pharm. 2022;79:477-485

HENRY FORD HEALTH®

Antimicrobial Stewardship Strategies Targeting Transitions of Care

Nisha Patel, Pharm.D., BCPS

Clinical Pharmacist – Internal Medicine

Henry Ford Health – Detroit

November 3, 2023