Leveraging Data to Explore the Consequences of Urine Testing and Antibiotic Use During the Spinal Cord Injuries and Disorders Annual Evaluation

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Disclosure of Conflict of Interest

- Felicia Skelton has no commercial conflicts of interest relevant to this activity.
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  - VA Health Services R&D Career Development Award 1 IK2 HX002484-04 (Optimizing Bacteriuria Management in Veterans with Spinal Cord Injury)
  - VA RR&D Merit Award 1 I01 RX002595-01A2 (Bacteriophage to treat Multi-Drug Resistant UTI after Spinal Cord Injury)
  - VA Office of Rural Health
  - BCM Department of PM&R Pilot Award
  - National Science Foundation
- Advisory Board: (company name)
  - American Paraplegia Society Board of Directors
  - Association of Academic Physiatrists Public Policy Committee Chair/Board of Trustees Member

Objectives

Discuss

- Discuss the challenges in managing urinary tract infection (UTI), catheter-associated UTI (CAUTI) and asymptomatic bacteriuria (ASB) in patients with spinal cord injuries and disorders (SCI/D).

Describe

- Describe the Veterans Health Administration (VHA) SCI/D system of care, and how it influences bacteriuria management for its patients.

Describe

- Describe how CDW analysis utilizing the SCI/D Registry can guide antibiotic stewardship initiatives for the VHA SCI/D system of care.

Poll Question #1

- What is your primary role in VA?
  - Student, trainee, or fellow
  - Clinician
  - Researcher
  - Administrator, manager or policy-maker
  - Other

Poll Question #2

- How familiar are you with the VHA Spinal Cord Injuries and Disorders (SCI/D) Registry?
  - 1 (not at all familiar)
  - 2
  - 3
  - 4
  - 5 (very familiar)

Urinary tract infection (UTI, including catheter-associated UTI, or CAUTI) in people with SCI is

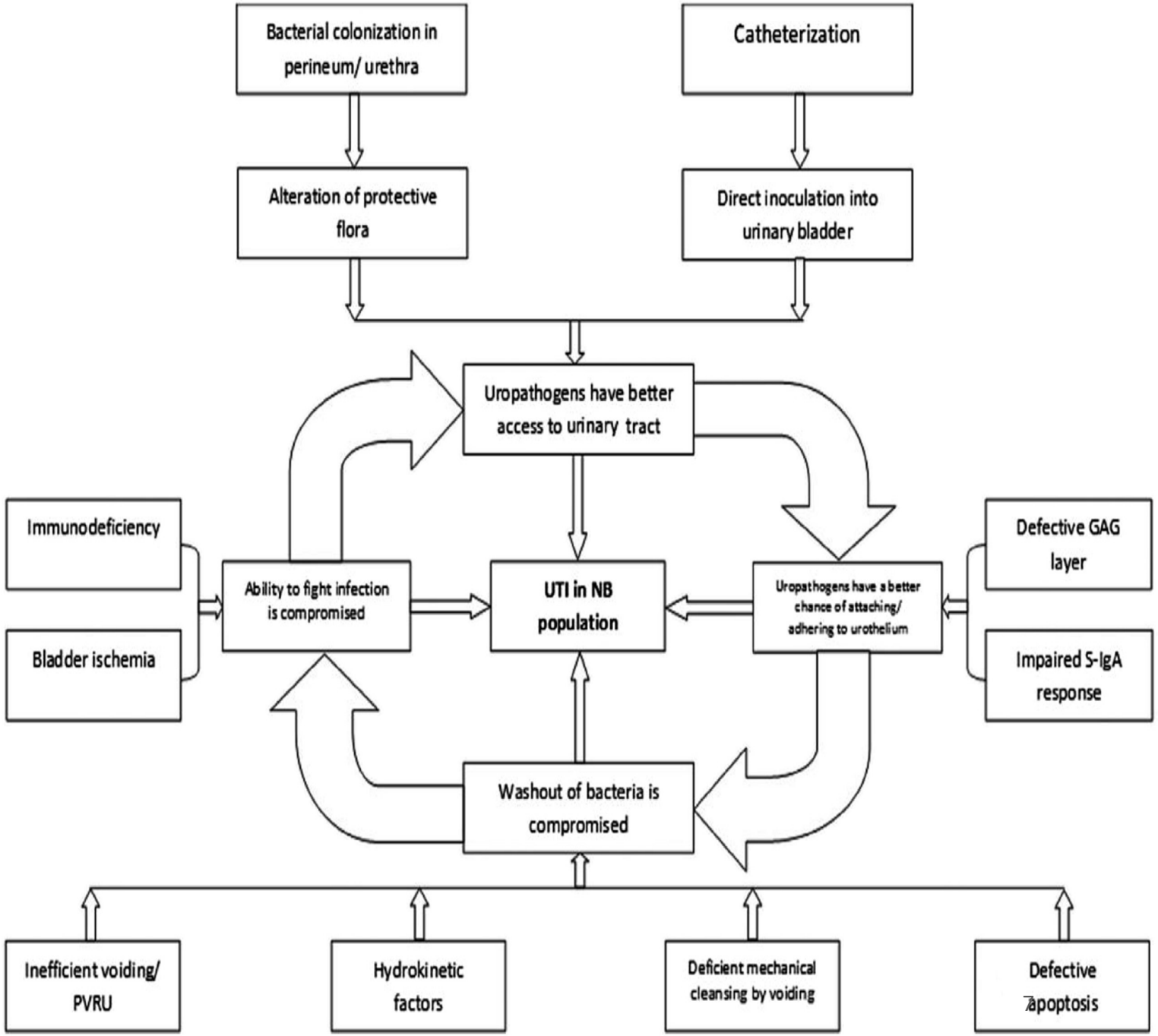
Common

Costly

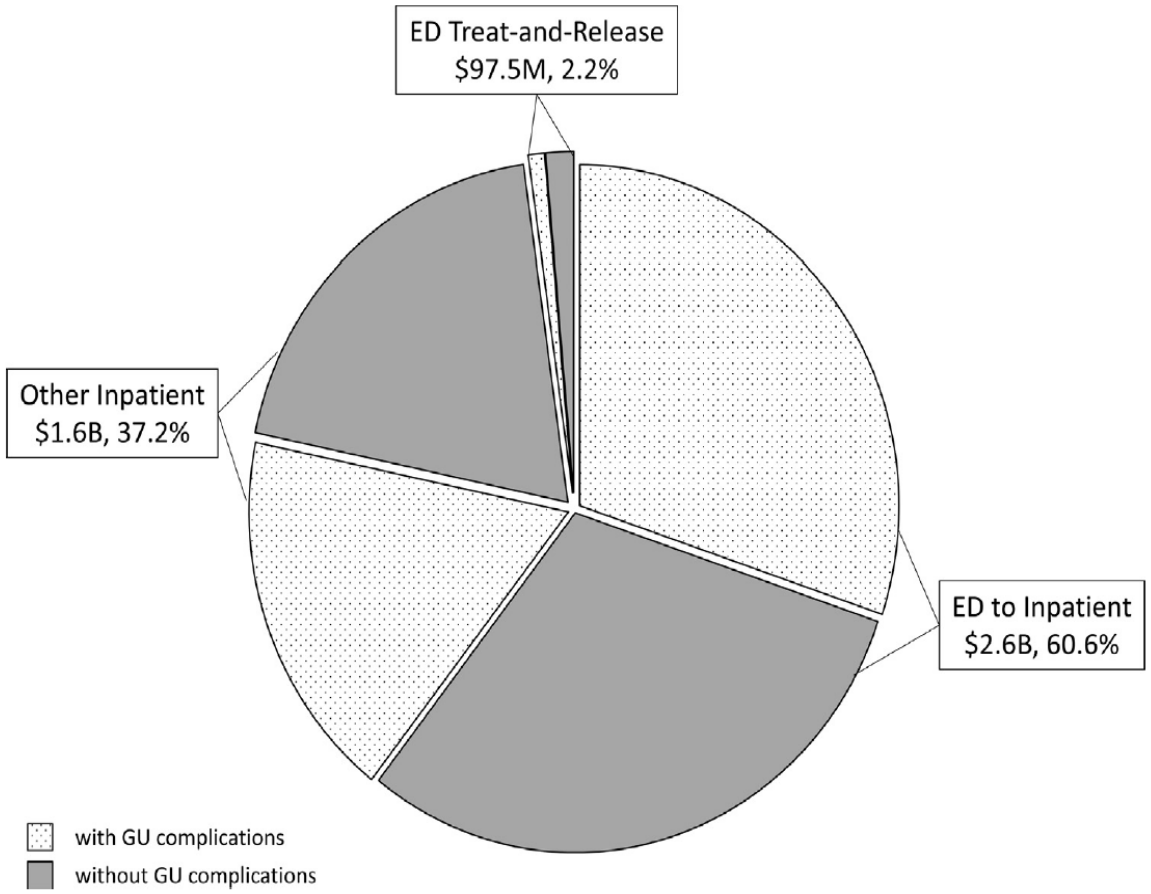
Confusing

Bacteriuria Management in SCI/D Presents Unique Challenges

McKibben, et al, *Urol Clin N Am,* 2015.



Retrospective cross-sectional and cost analysis of the 2006-2015 National Inpatient Sample and National Emergency Department Sample from the Healthcare Cost and Utilization Project



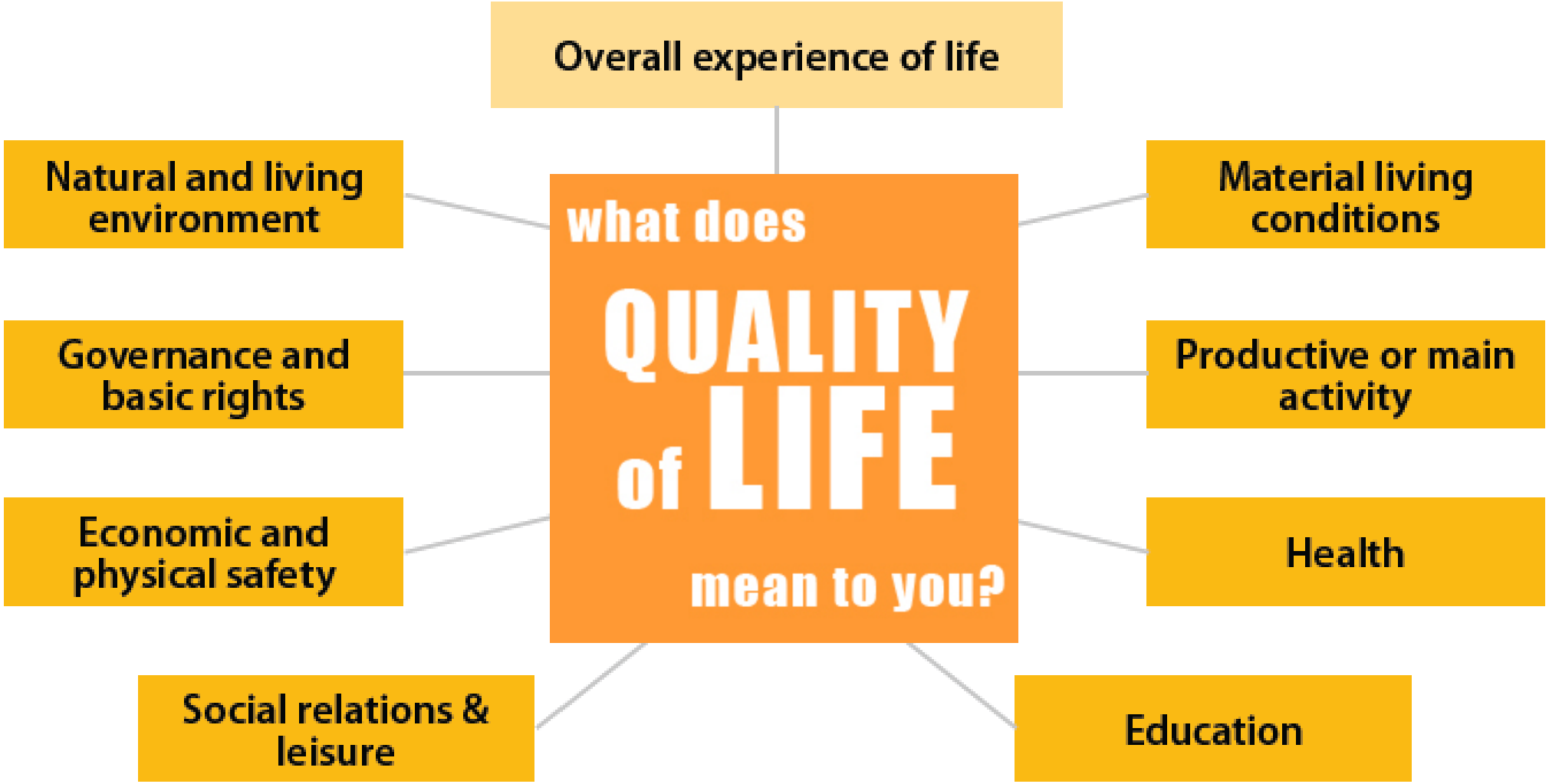
Inpatient and Emergency Department visits for persons with SCI/D
Costs expressed as millions (M) or billions (B) of 2015 US dollars

- Skelton, F, et al. Arch Phys Med Rehabil. 2019.

Diagnosing CAUTI after SCI is challenging

- High rates of CAUTI, but also high rates of ASB that does not require treatment
- Presenting signs and symptoms of infection are challenging to interpret
- High rates of multi-drug resistant organisms isolated from the urine and antibiotic complications, such as *C. difficile* infection

- Nicolle LE, et al. Clinical Practice Guideline for the Management of Asymptomatic Bacteriuria: 2019, *Clin Infect Dis,* 2019.
- Fitzpatrick MA, et al, *J Spinal Cord Med,* 2017.
- Ramanathan S, et al, *Am J Infect Control,* 2014.


Overall experience of life
Natural and living environment
Material living conditions
what does
QUALITY
of LIFE
mean to you?
Governance and basic rights
Productive or main activity
Economic and physical safety
Health
Social relations & leisure
Education

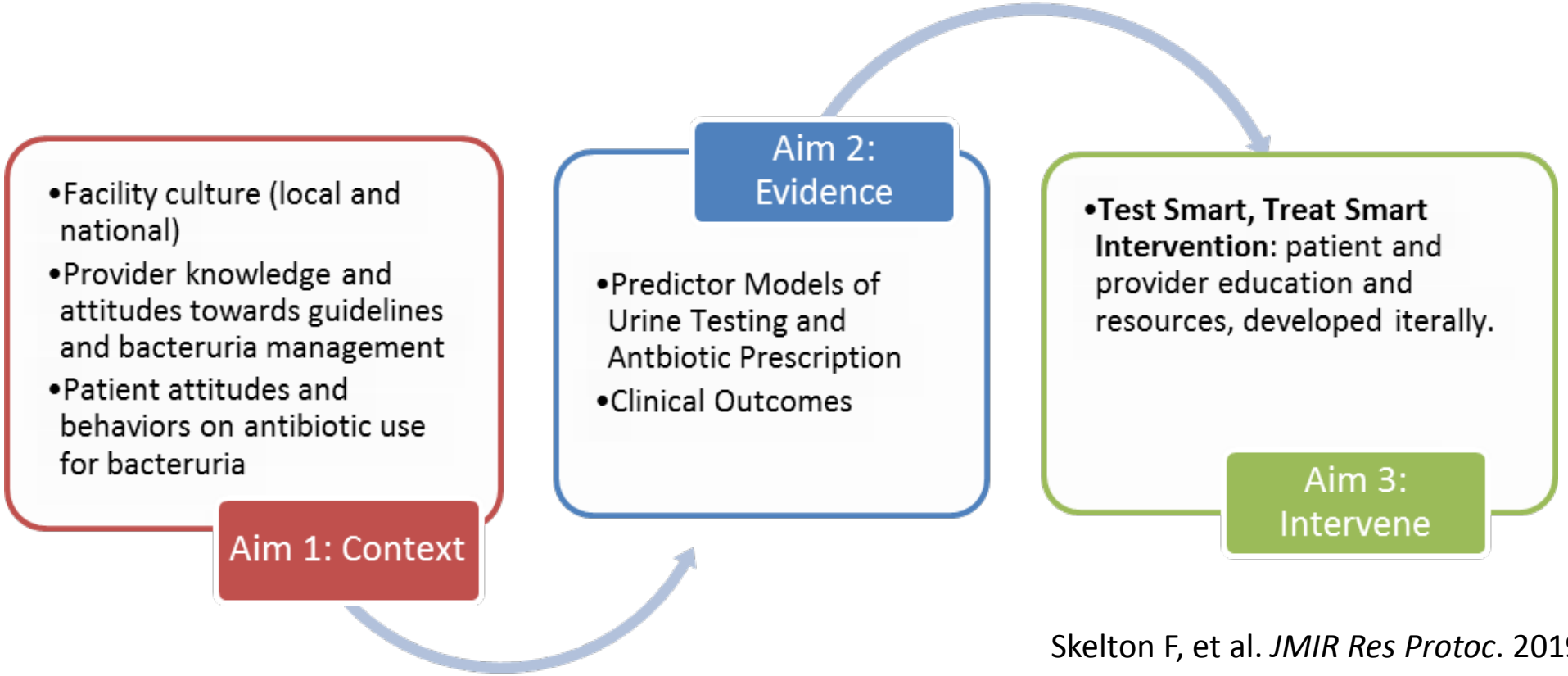
Gaps In Current Knowledge

We need to understand what SCI/D patients believe, want, and expect in regards to having their urine tested annually, and being prescribed and adhering to antibiotics.

We need to understand SCI/D providers' concerns and rationale behind urine testing in the absence of symptoms.

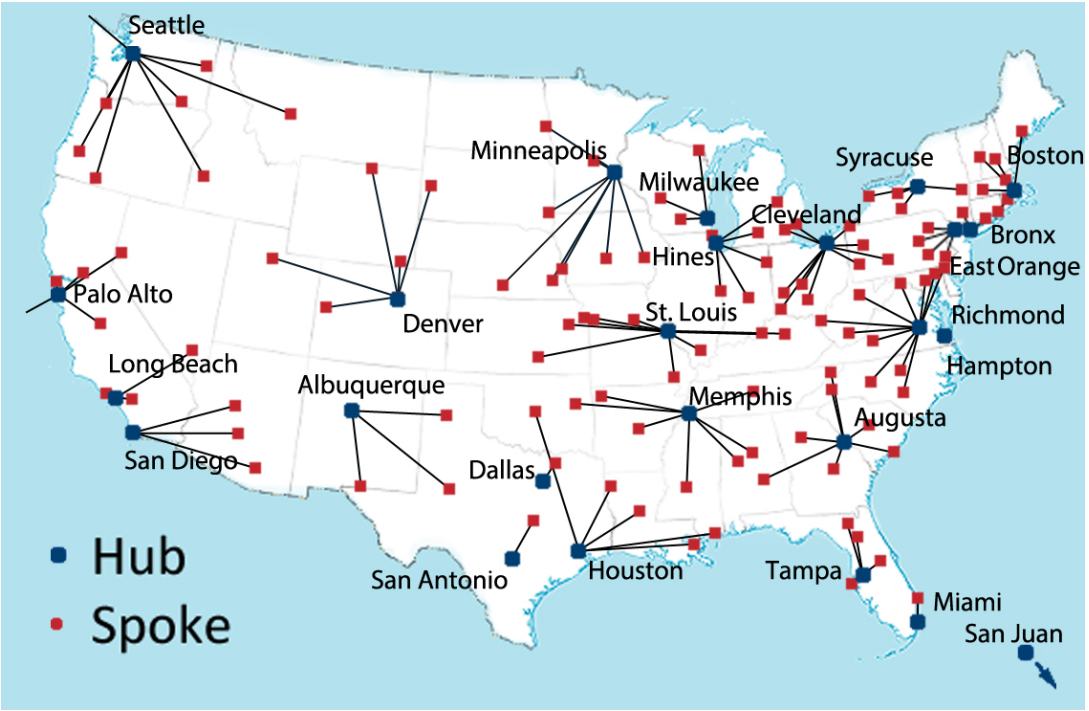
We need to understand the outcome of these testing and treatment decisions on a national scale to disprove or prove our hypotheses.

Optimizing Bacteriuria Management in Veterans with SCI/D



Skelton F, et al. *JMIR Res Protoc*. 2019.

Preliminary Study

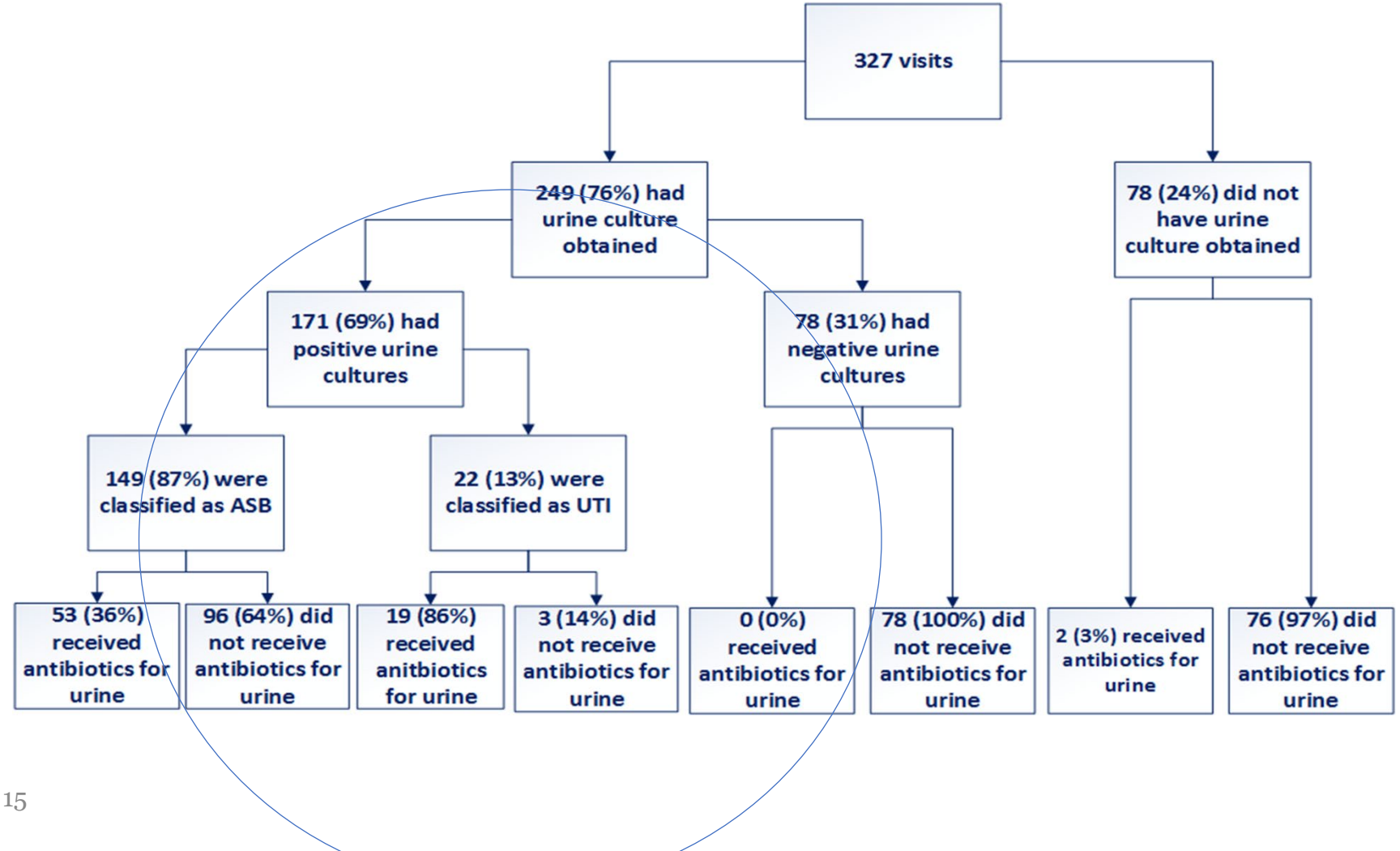


https://www.sci.va.gov/index.asp

VHA SCI/D System of Care

- 25 centers nationally
- Physiatrists as primary care physicians
- VHA 1176.02 and the SCI/D Annual Evaluation

Positive Urine Cultures Drive Antibiotic Use



Skelton, F, et, al. *Arch Phys Med Rehabil,* 2018.

Bacteriuria Management and Outcomes at a Single VHA SCI/D Clinic

Predictors of Antibiotic Use for ASB				
	Univariate		Multivariate	
	OR (95% CI)	p-value	OR (95% CI)	p-value
Age	1.06 (1.02-1.09)	<0.01*	1.05 (1.01-1.09)	<0.01**
LE +	8.71 (1.11-68.22)	0.04*	4.88 (0.57-41.83)	0.15
Nitrite +	2.44 (1.22-4.88)	0.01*	2.78 (1.31-5.90)	<0.01**
UPO on culture	3.42 (1.69-6.89)	<0.01*	2.92 (1.38-6.18)	<0.01**
OR=odds ratio; CI=confidence interval, LE=leukocyte esterase, UPO=urease-positive organism				

Skelton, F, et, al. *Arch Phys Med Rehabil,* 2018.

Next Step: Reproduce the concepts of this study on a national scale

Data Sources: Corporate Data Warehouse (CDW) and the SCI/D Registry Report from VHA Support Service Center (VSSC)

Identifying the SCI/D Annual Evaluation Encounter

- Was not readily apparent in CDW
- Tried using unique imaging tests done during the annual as a surrogate
  - Unmitigated disaster

VSSC Reports for SCI/D

The source for various operational reports (i.e clinic wait times, consult completion)

Medical center, VISN or national patient-level data

Available to most SCI/D providers from the National Program Office Website

FY22 Spinal Cord Injuries and Disorders (SCI/D) Annual Exams

SCI Only
Patients Utilizing VHA SCI/D Services Since October 1, 2012
Non-Deceased Only

Data Refresh Date: 10/8/2021

Data Definitions
VSSC Help Desk
Rate Report

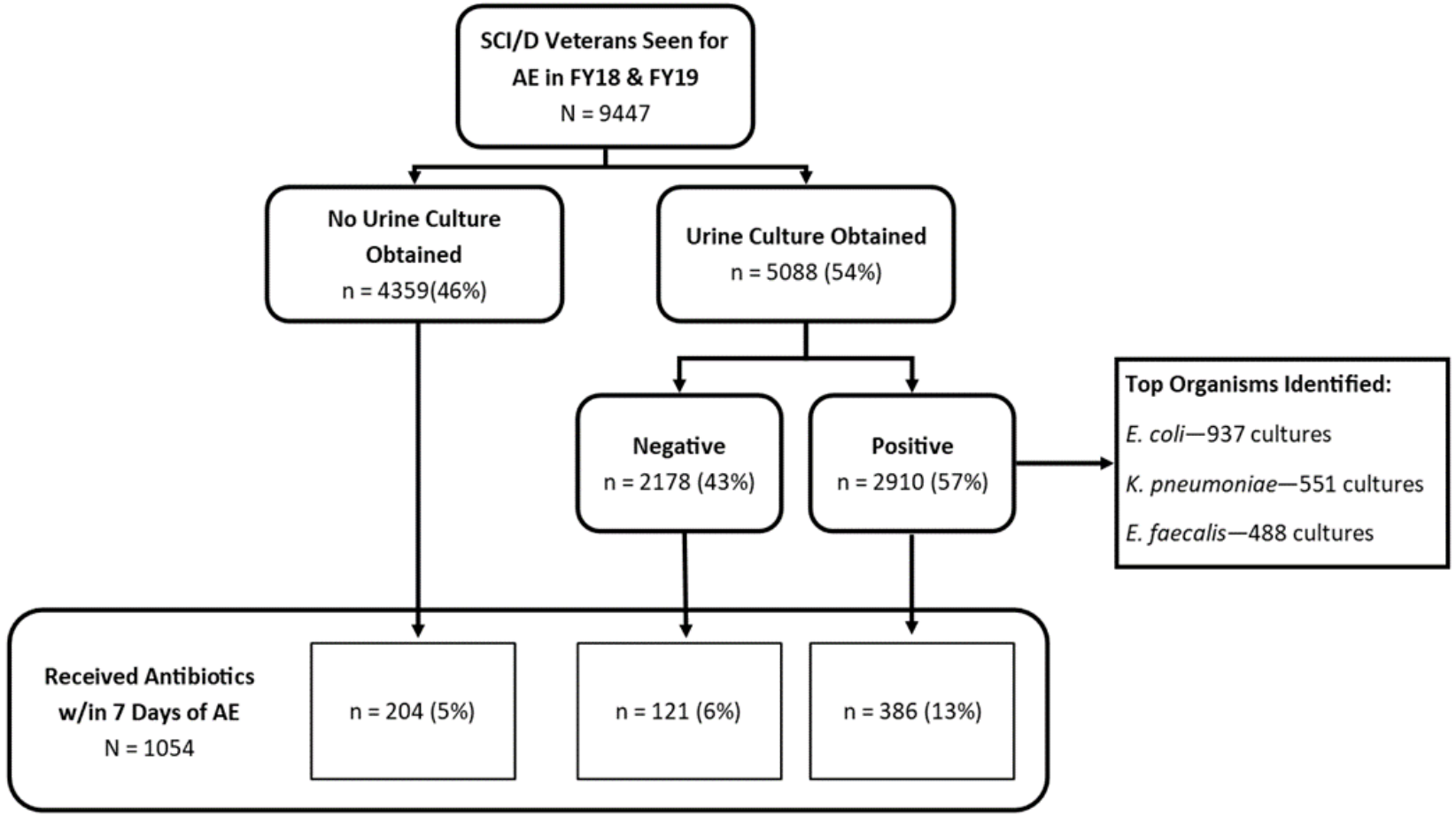
Level	by Closest SCI/D Facility				by Most Recent SCI/D Facility Utilization				by Closest SCI/D Facility and/or by Most Recent SCI/D Facility Utilization			
	Total Patients	Total Annual Exams Due	Total Annual Exams Done	Percent Done	Total Patients	Total Annual Exams Due	Total Annual Exams Done	Percent Done	Total Patients	Total Annual Exams Due	Total Annual Exams Done	Percent Done
⊞National	18,720	17,587	7,645	43.47%	18,720	17,587	7,645	43.47%	18,720	17,587	7,645	43.47%

Special thanks to Drs. Barry Goldstein (SCI/D National Office), Charlesnika Evans (Hines COIN) and Stephen Burns (VA Puget Sound) for their guidance and education on the new registry!

∃ Houston, TX HCS	**Houston, TX HCS - All Spoke Sites**	**1,020**
	(502) Alexandria, LA HCS	71
	(520) Gulf Coast, MS HCS	240
	(580) Houston, TX HCS	344
	(629) New Orleans, LA HCS	116
	(635) Oklahoma City, OK HCS	173
	(667) Shreveport, LA HCS	76

Identification of SCI Patients

- Previously a hand-maintained list with inclusion/exclusion criteria determined by each SCI/D center
- Now, uses CPRS data (FY13 to present) to identify patients with combination of ICD-9/10 codes AND current/prior receipt of VA SCI/D care types, including:
  - Bed section: category of inpatient ward if admitted
  - SCI Clinic Stop Code (210)
  - PACT assignment
- Includes deceased patients, FY2013 onward
- Registry Business Rules identify cohort (must have qualifying care in at least 2 categories)
- **For more info: see HSR&D Cyberseminar Presentation from 4/20/21 by Drs. Jennifer Sippel and Bridget Smith**

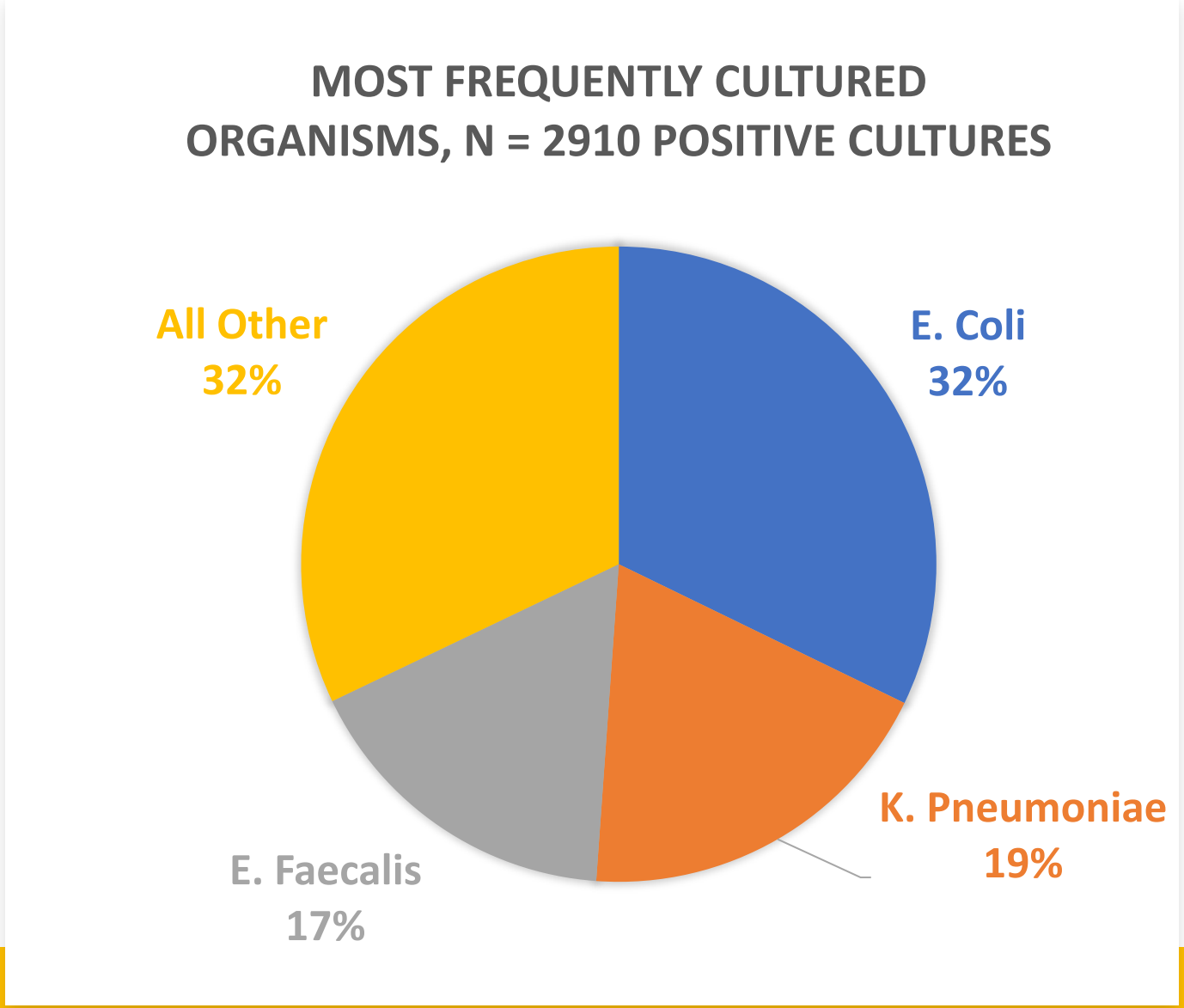


Positive Urine Cultures are Still Driving Antibiotic Use

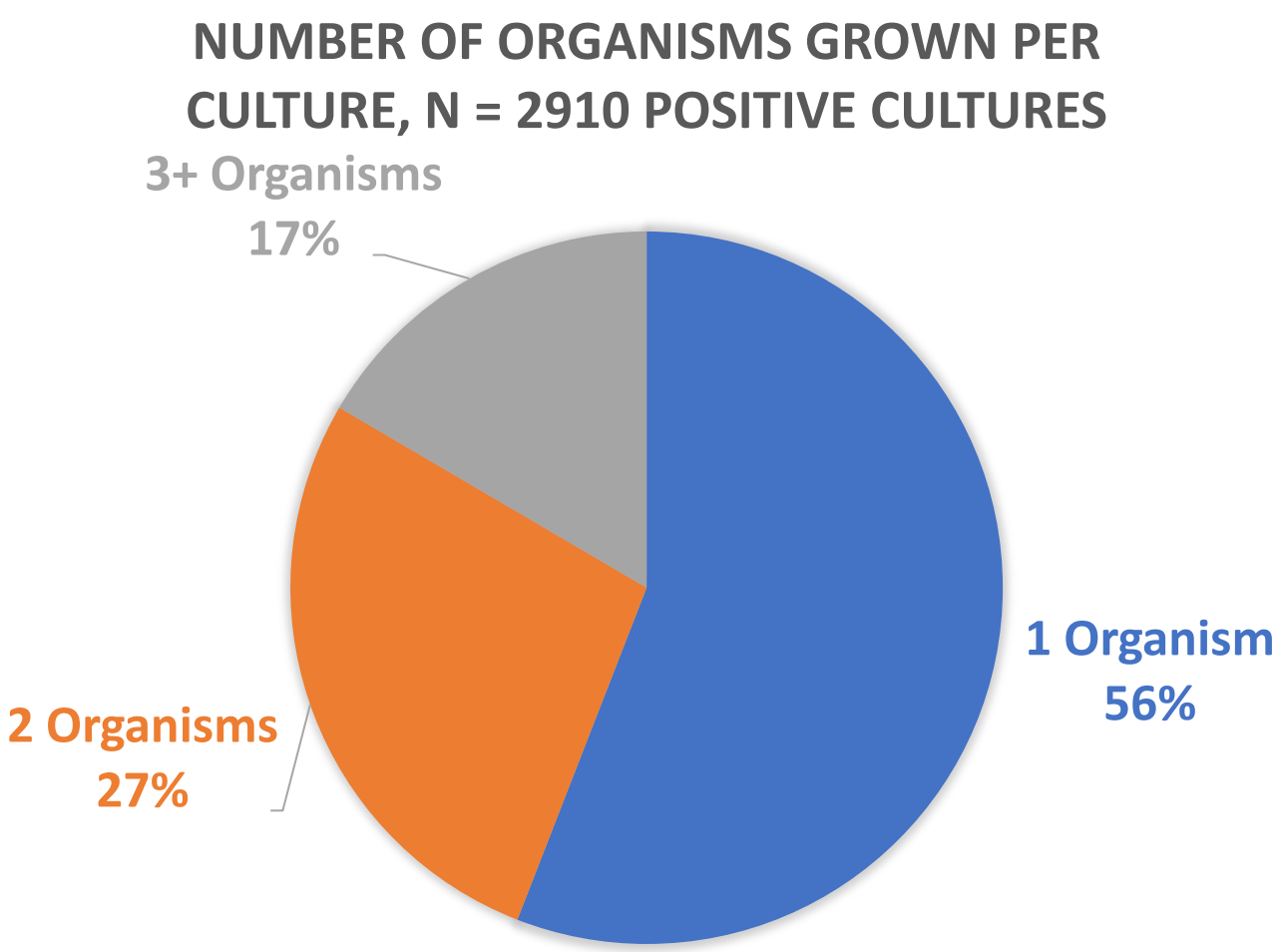
Participant Demographics

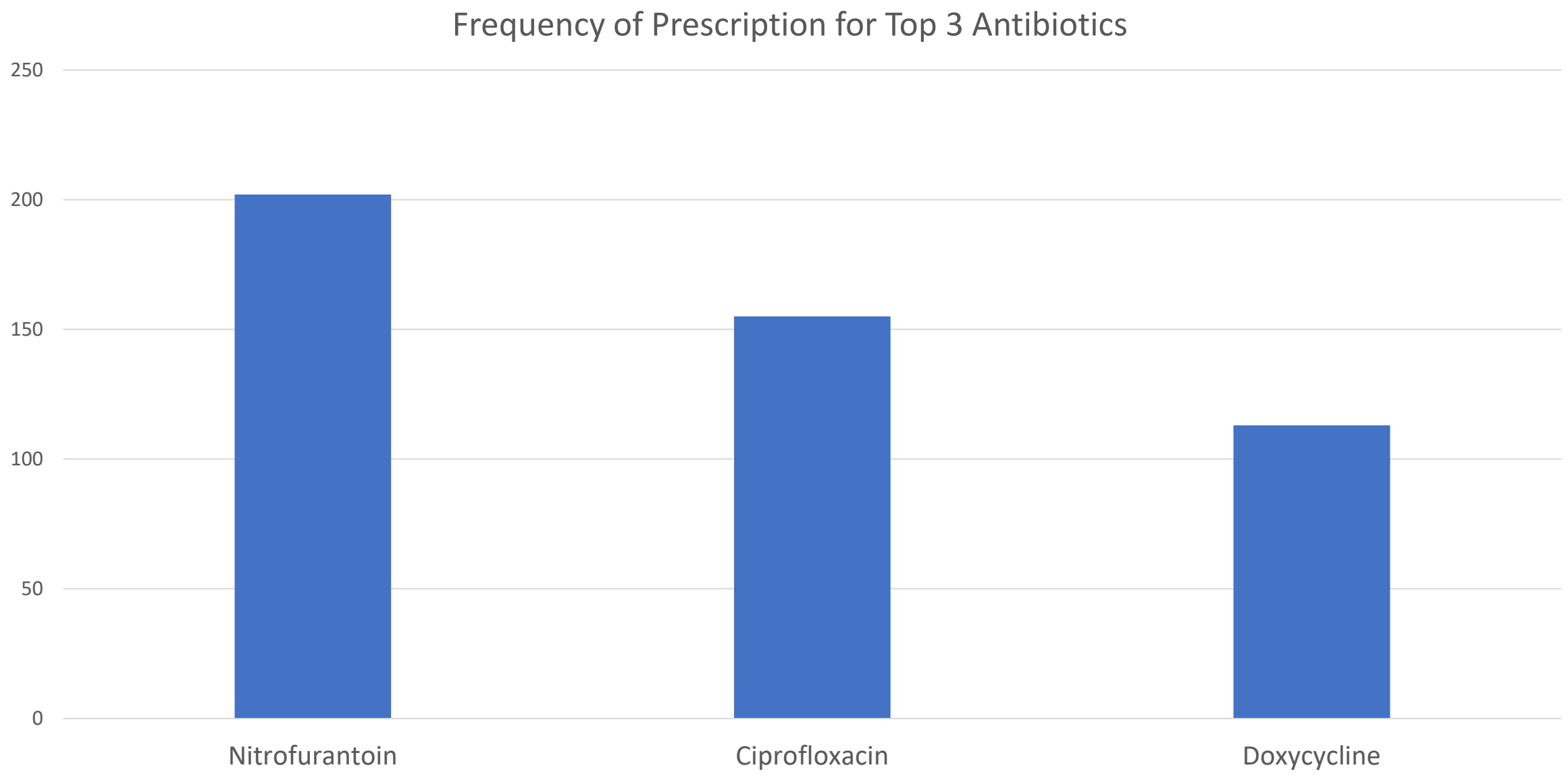
	TETRAPLEGIA AIS A-C N (%)	PARAPLEGIA AIS A-C N (%)	ALL AIS D N (%)	NOT CLASSIFIED N (%)	P-VALUE
	N = 1644	N = 2263	N = 4042	N = 1498	
Age, median (range)	62 (21 - 91)	63 (22 - 97)	67 (19 - 100)	68 (20 - 101)	<.0001
Male gender (%)	1593 (96.9)	2172 (96.0)	3872 (95.8)	1432 (95.6)	0.21
Ethnicity (%)					
White	1065 (64.8)	1602 (70.8)	2578 (63.8)	968 (64.6)	<.0001
Non-Latino Black	401 (24.4)	392 (17.3)	1078 (26.7)	340 (22.7)	
Other	178 (10.8)	269 (11.9)	386 (9.6)	190 (12.7)	
Etiology of Injury (%)					
Motor vehicle collision	636 (38.7)	911 (40.3)	705 (17.5)	73 (4.9)	<.0001
Fall	316 (19.2)	340 (15.0)	790 (19.5)	48 (3.2)	
Other	692 (42.1)	1012 (44.7)	2547 (63.0)	1377 (91.9)	
Co-morbidity index score, mean (SD)	2.06 (1.4)	2.06 (1.4)	2.37 (1.6)	2.61 (1.8)	<.0001
Bladder management (%)					
Evidence of catheter use	221 (13.4)	216 (9.5)	223 (5.5)	172 (11.5)	<.0001
No evidence of catheter use	1423 (86.6)	2047 (90.5)	3819 (94.5)	1326 (88.5)	
GISURH (% rural)	451 (27.4)	741 (32.7)	1098 (27.2)	417 (27.8)	<.0001
GeoScore, mean (SD)	99.9 (15.8)	99.5 (14.8)	98.7 (15.3)	99.0 (15.1)	0.03

Enterobacteriaceae species most isolated organisms

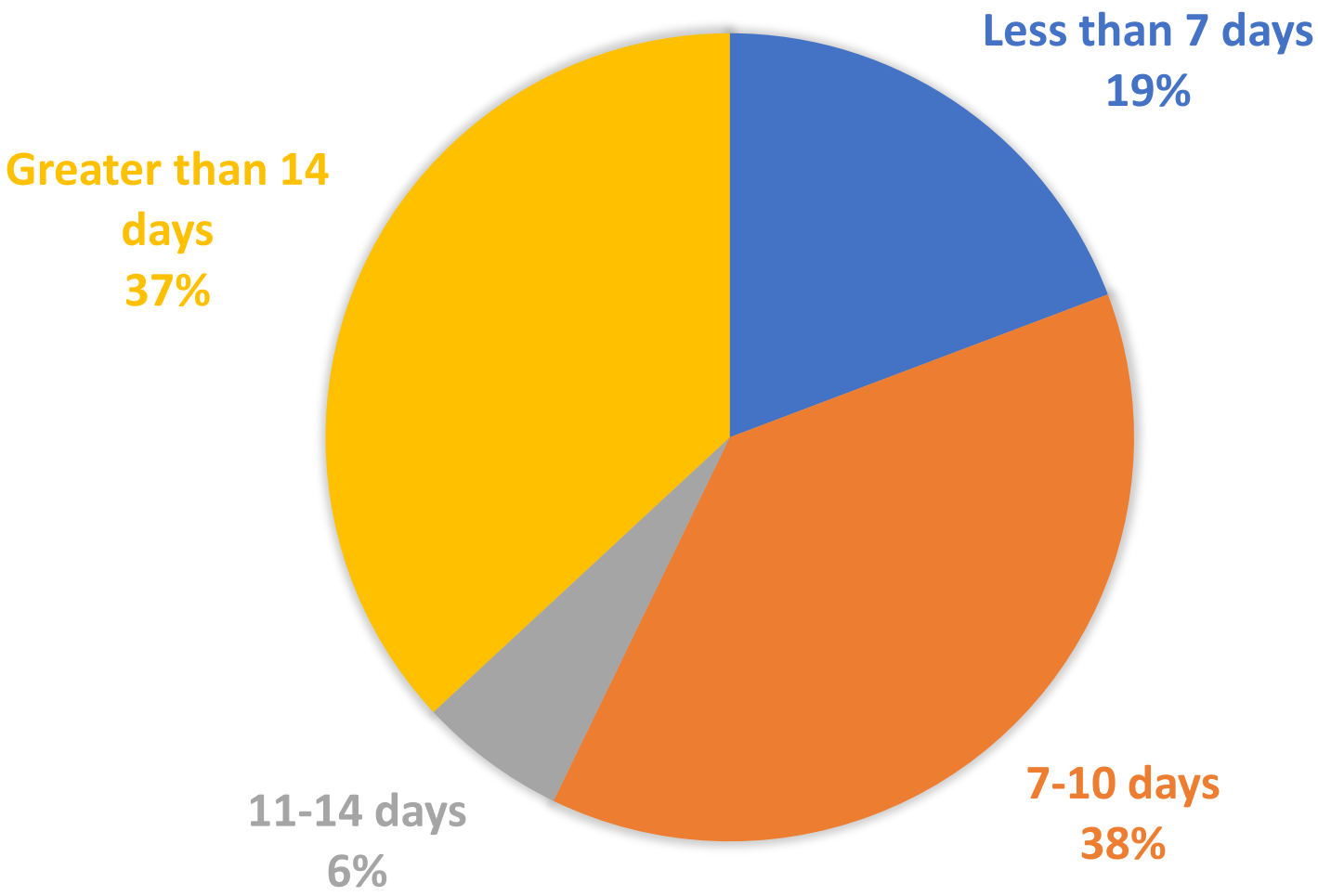


A significant number of urine cultures obtained were polymicrobial.




Frequency of Prescription for Top 3 Antibiotics
250
200
150
100
50
0
Nitrofurantoin
Ciprofloxacin
Doxycycline

DURATION OF ANTIBIOTIC USE

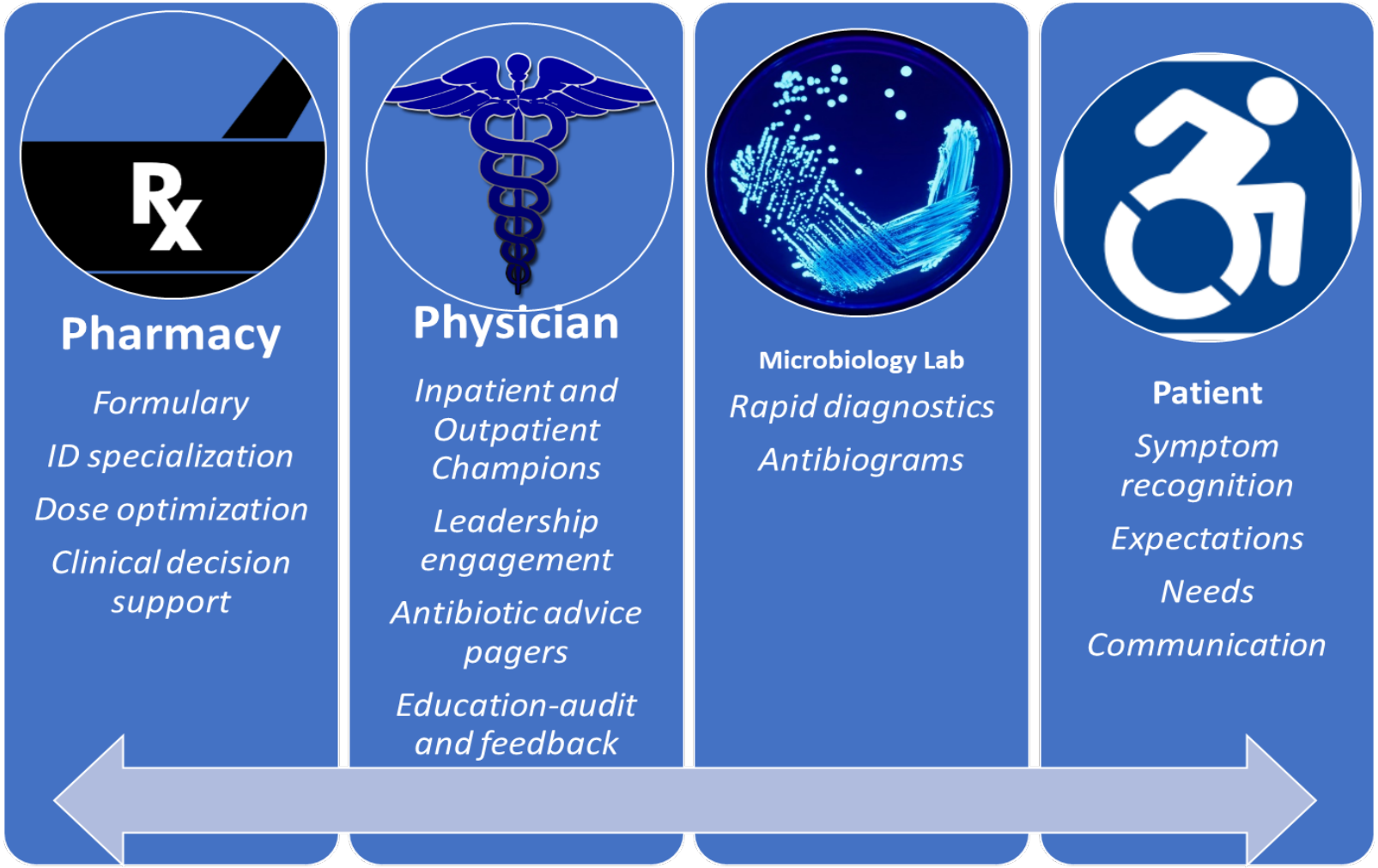


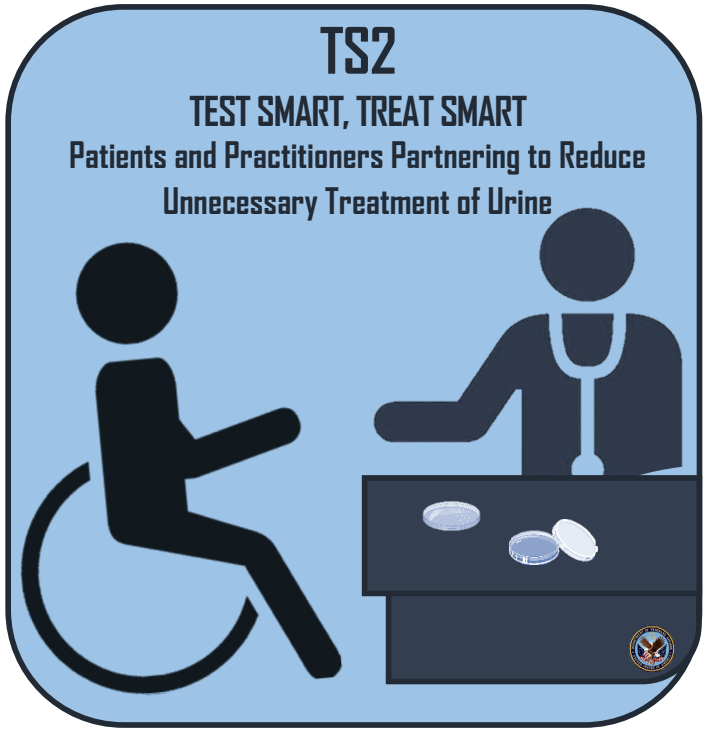
Patient Characteristics Associated with Receiving a Urine Culture

- **More Likely to Receive**
  - Black race
  - AIS D SCI
- **Less Likely to Receive**
  - Older age
  - Higher comorbidity index score
  - No evidence of catheter use

Patient Characteristics Associated with Antibiotic Use

- **More Likely to Use**
  - Higher comorbidity index score
  - *Enterobacteriaceae* identified on culture
  - Evidence of catheter use for bladder management
- **Less Likely to Use**
  - Black race
  - No urine culture obtained


Pharmacy
Formulary
ID specialization
Dose optimization
Clinical decision support
Physician
Inpatient and Outpatient Champions
Leadership engagement
Antibiotic advice pagers
Education-audit and feedback
Microbiology Lab
Rapid diagnostics
Antibiograms
Patient
Symptom recognition
Expectations
Needs
Communication


TS2
TEST SMART, TREAT SMART
Patients and Practitioners Partnering to Reduce Unnecessary Treatment of Urine

Future Directions

- Diagnostic tools or biomarkers to distinguish CAUTI from ASB in people with SCI/D
- SCI/D-specific CAUTI evidence, with the goals of
    - Minimizing catheter-related harm
    - Reducing emergence of antibiotic resistance
    - Improve quality of life for SCI/D patients

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