One and Done:
The Impact of Single-Dose Antibiotic Treatment in Emergency Care for Cystitis and Skin and Soft Tissue Infections

Brett Dragomer, PharmD, BCPS, BCIDP
Audry Barrera, PharmD; PGY2 – HSPAL Resident
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Ochsner™ Health System

Learning Objectives

- Assess the clinical and economic impact of a one-time dose treatment for stable patients with skin and soft tissue infections (SSTI) or cystitis in emergency care settings.
- Determine the appropriateness of single-dose antibiotic use in the treatment of *SSTI* and cystitis.
- Discuss the implications for antimicrobial stewardship and pharmacy administration in emergency care settings

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Outline

Clinical Background

Literary Review

- Dalbavancin
- Gentamicin

Research Overview

- Background
- Objectives and Methodology
- Protocol Inclusion and Exclusion Criteria
- Clinical and Economic Impact of Single-Dose Antibiotics through One and Done protocol
- Procedures
- Preliminary Findings
- Multi-Center Study

Implications for Antimicrobial Stewardship

- Antimicrobial Stewardship Updates
- Optimizing Utilization
- Potential Barriers and Challenges
- Future Directions

Summary

Knowledge Check

A 45-year-old female presents to the ED with symptoms of cellulitis.

What is one of the key benefits of using dalbavancin for treating SSTI in this patient?

A) It requires daily infusions.
B) It is effective against both Gram-positive and Gram-negative bacteria.
C) It can be administered as a single dose, which can facilitate early discharge.
D) It requires hospitalization for the duration of the treatment.

Knowledge Check

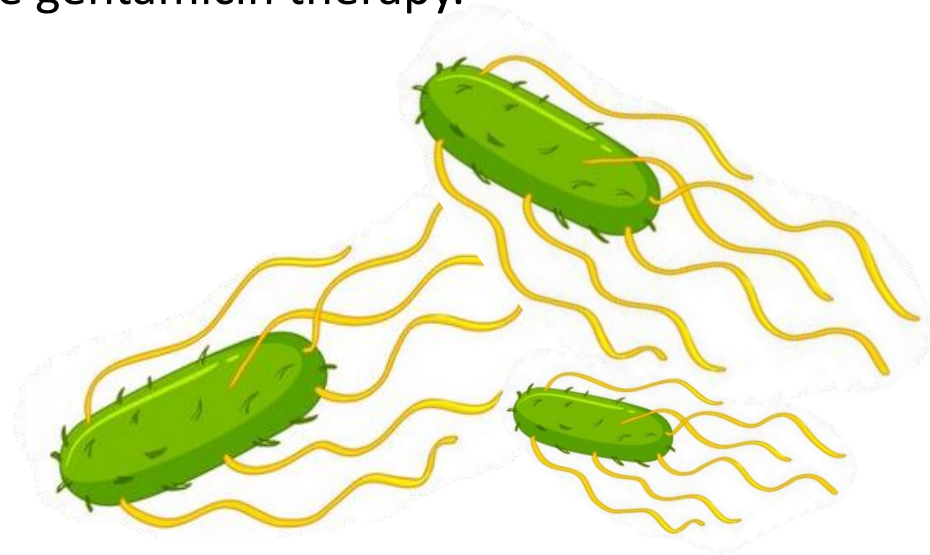
A multidisciplinary team is considering use of dalbavancin for a patient with cellulitis for an early discharge.

Which of the following is NOT a criterion for early discharge using dalbavancin?

A) The patient has a deep-seated infection such as osteomyelitis.
B) The patient cannot take oral antibiotics due to contraindications.
C) The patient is expected to have poor adherence to oral medications.
D) The patient is hemodynamically stable.

Knowledge Check

A 28-year-old female presents to the ED with symptoms of a urinary tract infection (UTI). She has no significant medical history and is hemodynamically stable. The healthcare team considers a single-dose gentamicin therapy.



What is the expected microbiologic cure rate for this patient if treated with single-dose gentamicin?

A) 40-50%
B) 50-60%
C) 70-80%
D) 86-98%

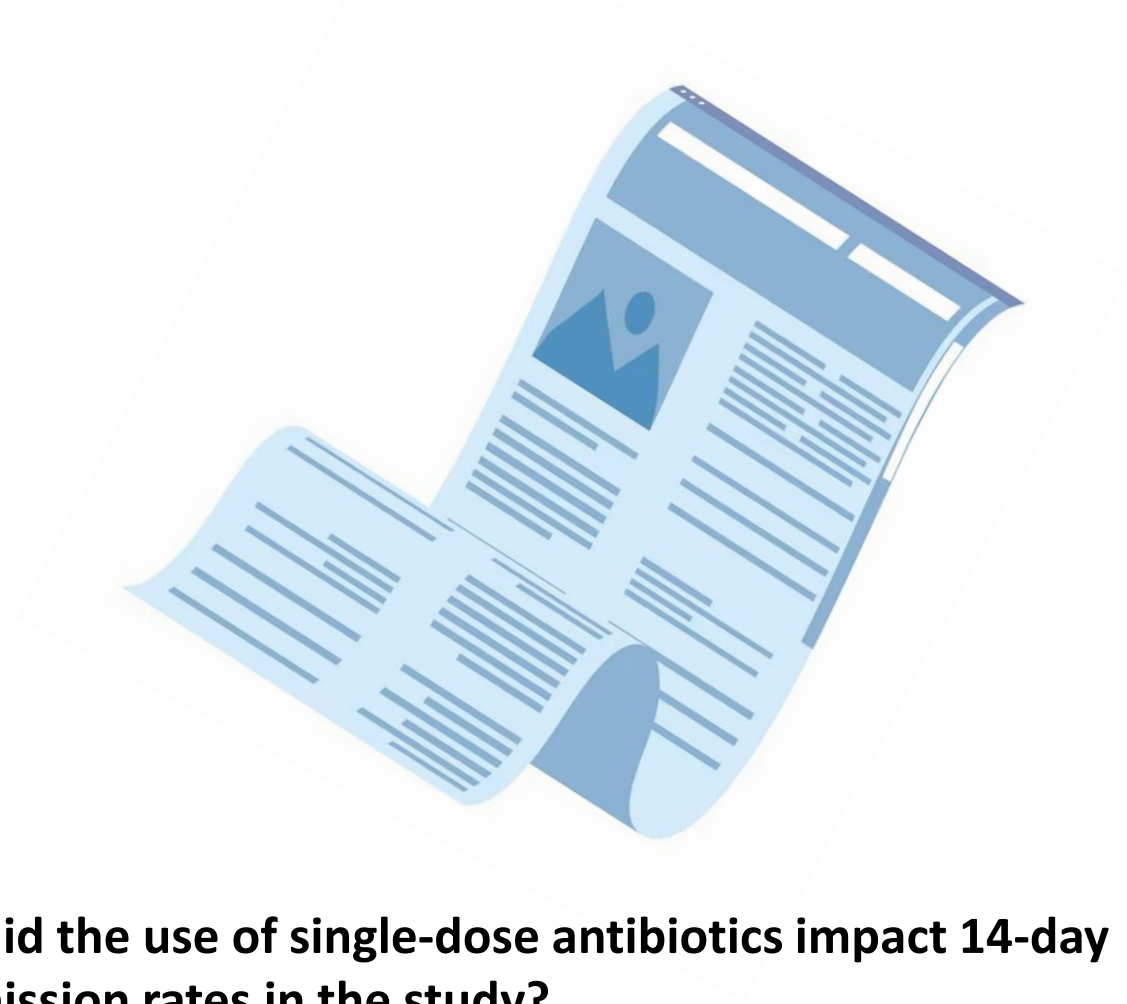
Knowledge Check

In a hospital setting with high resistance rates to multiple antibiotics, including fluoroquinolones, a 40-year-old patient is diagnosed with an uncomplicated UTI. The local antibiogram shows an 8% resistance rate to gentamicin for E. coli.

Based on the reviewed evidence, what would be the appropriate next step?

A) Prescribe a multi-dose regimen of a different antibiotic
B) Initiate single-dose gentamicin therapy
C) Avoid gentamicin due to potential resistance
D) Use a combination of gentamicin with another antibiotic

Knowledge Check



How did the use of single-dose antibiotics impact 14-day readmission rates in the study?

A) Increased readmission rates
B) Decreased readmission rates
C) No change in readmission rates
D) Inconsistent effect on readmission rates

Key Abbreviations

- ABSSSI – acute bacterial skin and skin structure infections
- ADR – adverse drug reaction
- AMS – antimicrobial stewardship
- ED – emergency department
- GBS – group B Streptococcus
- IDSA – Infectious Diseases Society of America
- MRSA – methicillin resistance staph aureus
- MSSA – methicillin susceptible staph aureus
- NHAMCS – National Hospital Ambulatory Medical Care Survey
- SSTI – soft skin and tissue infections
- UPEC – uropathogenic Escherichia coli
- UTI – urinary tract infection = simple cystitis

Background

Non-Purulent Cellulitis

NHAMCS: Cellulitis: 1,654,000 ED visits in 2021

Common Bacteria:

- Streptococcus pyogenes
- Streptococcus agalactiae
- Staphylococcus aureus

Presentation:

- Redness
- Swelling
- Tenderness
- Pain

Image from: dermnetnz.org

NAMCS/NHAMCS - Ambulatory Health Care Data Homepage. Published 2019.

Background

Treatment for Non-Purulent Cellulitis

- Beta-lactams
  - Penicillins
  - Cephalosporins
- Lincosamide
  - Clindamycin
- Glycopeptide/Penicillin + Beta-lactamase inhibitor
  - Vancomycin and Piperacillin/Tazobactam

Image from: FreePik

Practice Guidelines for the Diagnosis and Management of Skin and Soft Tissue Infections. *Clinical Infectious Diseases*. 2014

Background

Cystitis
NHAMCS Cystitis: 843,000 ED visits in 2021

Common Bacteria:

- Escherichia Coli
- Proteus mirabilis
- Klebsiella pneumoniae

Presentation:

- Painful urination
- Increased frequency
- Suprapubic pain

Flores-Mireles AL, *Nat Rev Microbiol*. 2015;13(5):269-284.
Practice Guidelines for the Treatment of Acute Uncomplicated Cystitis and Pyelonephritis in Women. *Clinical Infectious Diseases*. 2011

Background

Treatment for Cystitis

- Trimethoprim/Sulfamethoxazole
- Nitrofurantoin
- Fosfomycin
- Fluoroquinolones
- Beta-lactams

Image from: FreePik

Practice Guidelines for the Diagnosis and Management of Skin and Soft Tissue Infections. *Clinical Infectious Diseases*. 2014

Literary Review

Boucher et al. (2014)

Once-Weekly Dalbavancin versus Daily Conventional Therapy for Skin Infection
DISCOVER 1 2 dose dalbavancin non-inferior to vancomycin/linezolid for the treatment of complicated soft tissue infections compared to 10 -14 days of vancomycin/linezolid
DISCOVER 2 1 dose dalbavancin has displayed noninferiority when compared to 2 dose regimens

Boucher HW, Wilcox M, Talbot GH, Puttagunta S, Das AF, Dunne MW. *New England Journal of Medicine*. 2014;370(23):2169-2179.

Oliva et al. (2023)

Direct or early discharge of Acute Bacterial Skin and Skin Structure Infection patients from the Emergency Department/Unit: Place of therapy of Dalbavancin.

Aim: review current literature on dalbavancin for ABSSSIs and identify patients that could benefit most from an antimicrobial therapy with dalbavancin in the ED allowing early discharge.

Inclusion

- Patients unable to take oral treatment
- Contraindications to oral agents
- DDI or risk with linezolid
- Anticipated poor adherence to oral medications
- In long-term care facility
- Person who injects drugs

Cost savings: $1,442-$4,803
Reduced in-hospital length of stay

Oliva A, Carbonara S, Cianci V, et al. 2023:1-19.

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Goodlet et al. (2019)

A Systematic Review of Single-Dose Aminoglycoside Therapy for Urinary Tract Infection: Is It Time To Resurrect an Old Strategy?

13 studies
N = 13,804

Age: 2 weeks - 70 years
7 studies – children only
7 studies – comparator arm (oral therapy)

ADR: 64/13,804

Cure rate: 87-100%

Goodlet KJ, Benhalima FZ, Nailor MD.2019. Antimicrob Agents Chemother63:10.1128/aac.02165-18.

Goodlet et al. (2019)

	Fairly et al. (1978)	Varese et al. (1980)	Bailey et al. (1984)	Prát et al. (1984)
Population	Adults with UTI	Pediatrics with UTI	Adults with UTI	Adults with different forms of UTIs
Intervention	Single-dose kanamycin	Single-dose netilmicin	Single-dose netilmicin	Single-dose netilmicin
Comparator	None	None	5-day course of co-trimoxazole	Conventional therapies
Outcome	Effective in managing UTI	Effective with minimal side effects	Comparable effectiveness	Effective for different forms of UTIs

Goodlet KJ, Benhalima FZ, Nailor MD.2019. Antimicrob Agents Chemother63:10.1128/aac.02165-18.

Goodlet et al. (2019)

	Khan et al. (1984)	Vigano et al. (1985)	Rocca Rossetti et al. (1986)	Varese et al. (1987)
Population	Adults with simple UTI	Children with UTIs	Adults with simple UTIs	Children with UTIs
Intervention	Single-dose gentamicin	Single-dose netilmicin	Single-shot amikacin	Trometamol salt of Fosfomycin
Comparator	Standard multi-dose therapy	None	Conventional therapy	Netilmicin
Outcome	Comparable treatment and high cure rates	Effective	Comparable efficacy	Effective and comparable

Goodlet KJ, Benhalima FZ, Nailor MD.2019. Antimicrob Agents Chemother63:10.1128/aac.02165-18.

Goodlet et al. (2019)

	Wallen et al. (1985)	Krzeska et al. (1986)	Grimwood et al. (1988)	Caramelli et al. (1990)	Principi et al. (1992)
Population	Adults with UTIs	Adults with simple UTI	Adults with simple UTI	Adults with UTI	Pediatric patients with UTI
Intervention	Single-dose gentamicin	Single-dose gentamicin	Single-dose gentamicin	Single-dose netilmicin	Single-dose gentamicin
Comparator	Multi-dose therapy	Conventional multi-dose therapy	Standard multi-dose regimens	None	Standard multi-dose regimens
Outcome	Effective in UTIs	Effective	Effective and comparable	Effective	Effective with minimal side effects

Goodlet KJ, Benhalima FZ, Nailor MD.2019. Antimicrob Agents Chemother63:10.1128/aac.02165-18.

IDSA (2023)

Guidance on the Treatment of Antimicrobial Resistant Gram-Negative Infections		
Gentamicin	Uncomplicated cystitis: 5 mg/kg/dose IV as a single dose	Adjusted body weight for patients >120% of ideal body weight

Targeted pathogens:

- ESBL Enterobacterales
- AmpC Enterobacterales
- Carbapenem resistant Enterobacterales
- Pseudomonas aeruginosa
- Carbapenem resistant Acinetobacter baumannii
- Stenotrophomonas maltophilia

Infectious Diseases Society of America 2023 *Clinical Infectious Diseases*, 2023;, ciad428

Pathogen Resistance to Gentamicin

Pseudomonas aeruginosa:

- **Resistance Range**:
- **8% to 30%**
- **Notes:** Pseudomonas aeruginosa showed higher and more variable resistance rates, which may limit the efficacy of gentamicin for some infections caused by this pathogen.

Klebsiella pneumoniae:

- **Resistance Range**:
- **5% to 25%**
- **Notes**: Klebsiella species demonstrated variable resistance, with some studies reporting higher resistance rates. Monitoring and local antibiogram data are crucial for effective treatment.

Escherichia coli (E. coli):

- **Resistance Range**:
- **2% to 14%**
- **Notes**: E. coli showed generally low resistance to gentamicin, making it an effective option for treating UTIs caused by this pathogen.

Proteus mirabilis:

- **Resistance Range**:
- **0% to 10%**
- **Notes**: Proteus mirabilis exhibited low resistance to gentamicin, supporting its use in UTIs caused by this organism.

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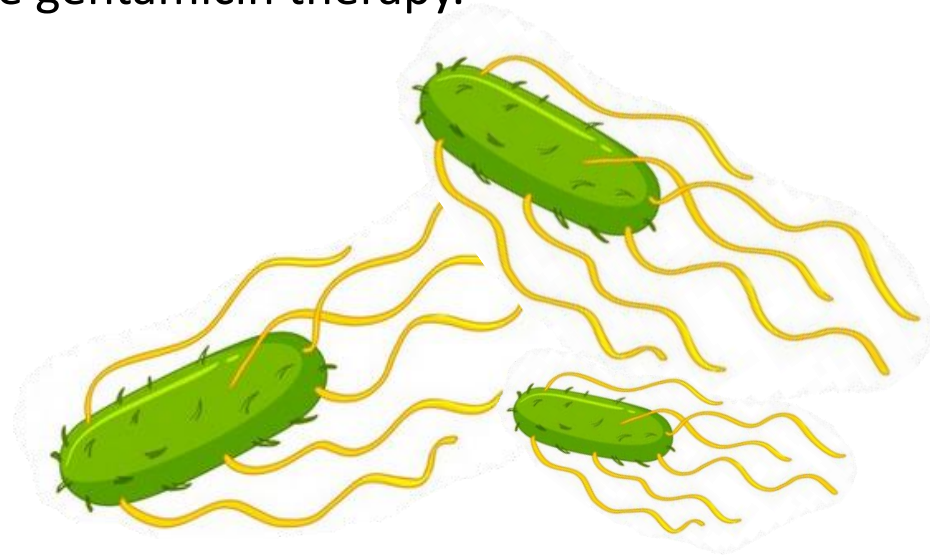

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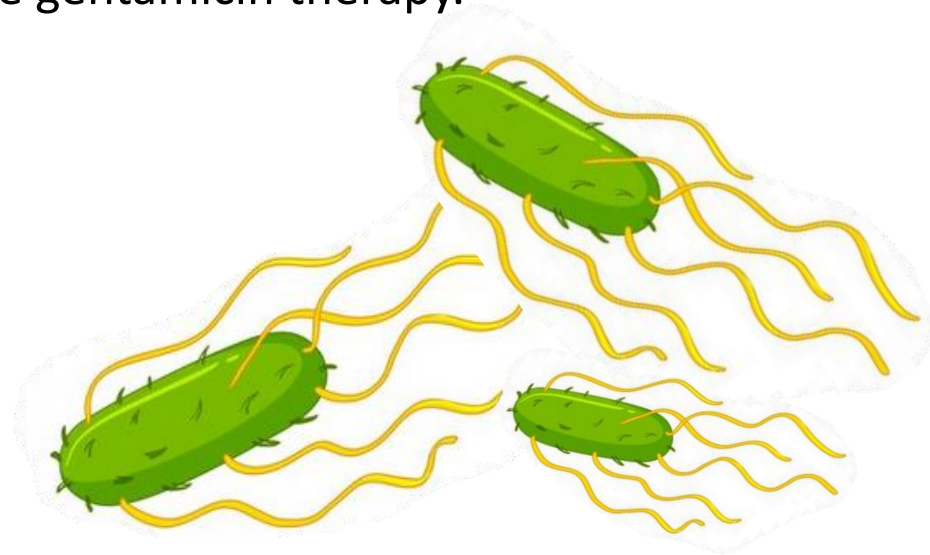

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Research Overview

Research Background

Goal:

- Reduce admissions of stable patients with SSTI or UTI

Focus:

- Skin and Soft Tissue Infections
- Urinary Tract Infections

Research Objectives and Methodology

One and Done Protocol: Non-purulent Cellulitis

Dalbavancin

- CrCl ≥ 30ml/min: 1500mg IV x 1 dose
- CrCl < 30ml/min: 1125mg IV x 1 dose

- Long-Acting Glycopeptide
- 30-minute infusion time
- Approved indications: cellulitis, wound infections and major cutaneous abscesses

Inclusion/Exclusion Criteria

One and Done Protocol – SSTI Criteria

Inclusion	Exclusion
• Patients ≥ 18 years old • Hemodynamically stable and appropriate for outpatient treatment • Not a candidate for oral antibiotic therapy, due to socioeconomic, physiological or other health factors • Not pregnant or nursing	☐ Hemodynamic instability (severe sepsis, septic shock, bacteremia, necrotizing fasciitis, endocarditis) ☐ Catheter-site or device related infection ☐ Deep-seated infections (Osteomyelitis) ☐ Currently receiving immunosuppression therapy or chemotherapy ☐ Known true anaphylactic reaction to vancomycin (not “Vancomycin Infusion/Flushing Syndrome or reaction”), oritavancin, dalbavancin or televancin ☐ Patient is candidate for oral antibiotic therapy

Research Objectives and Methodology

One and Done Protocol:

Cystitis

Gentamicin

- Single Dose Aminoglycoside 5mg/kg, IV or IM

- High efficacy, low toxicity
- Stable UTI without complications
- Secreted in urine at 100x concentration

Inclusion/Exclusion Criteria

One and Done Protocol – UTI Criteria

Inclusion	Exclusion
•Not a candidate for oral antibiotic therapy, due to socioeconomic, physiological or other health factors (resistance, allergies etc.) •Patients ≥ 18 years old •Hemodynamically stable and appropriate for outpatient treatment	☐ Hemodynamic instability (severe sepsis, septic shock, bacteremia, necrotizing fasciitis, endocarditis) ☐ Signs or suspicion of pyelonephritis ☐ History of kidney transplant ☐ Positive blood cultures

Procedure

Patient meets criteria

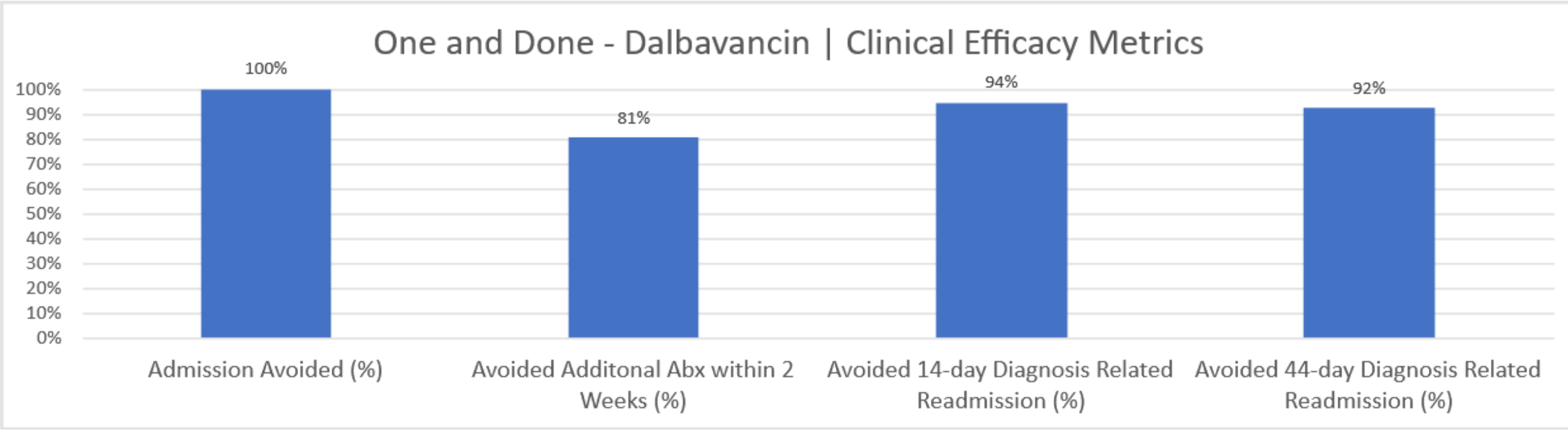
Prescription and medication order

Paperwork signed by patient

Medication administration

Monitoring and follow-up

Preliminary Findings



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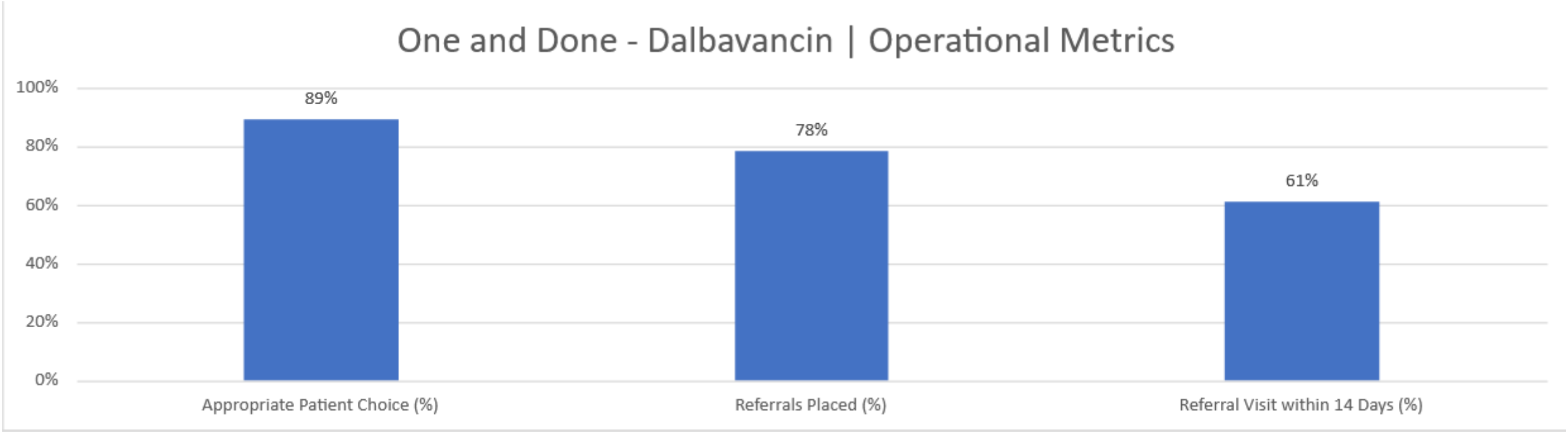

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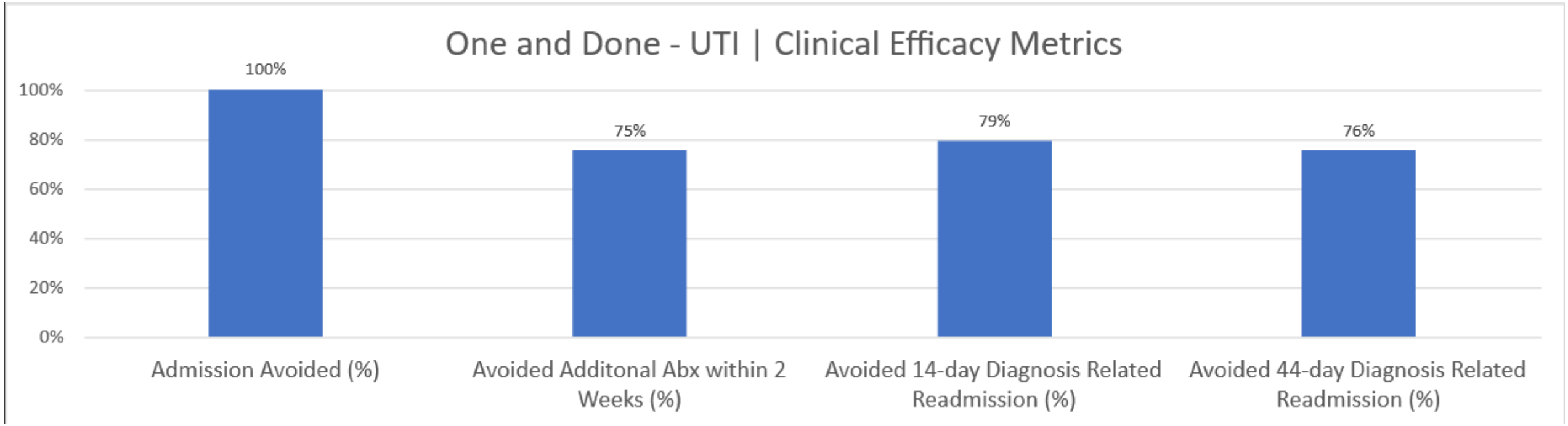

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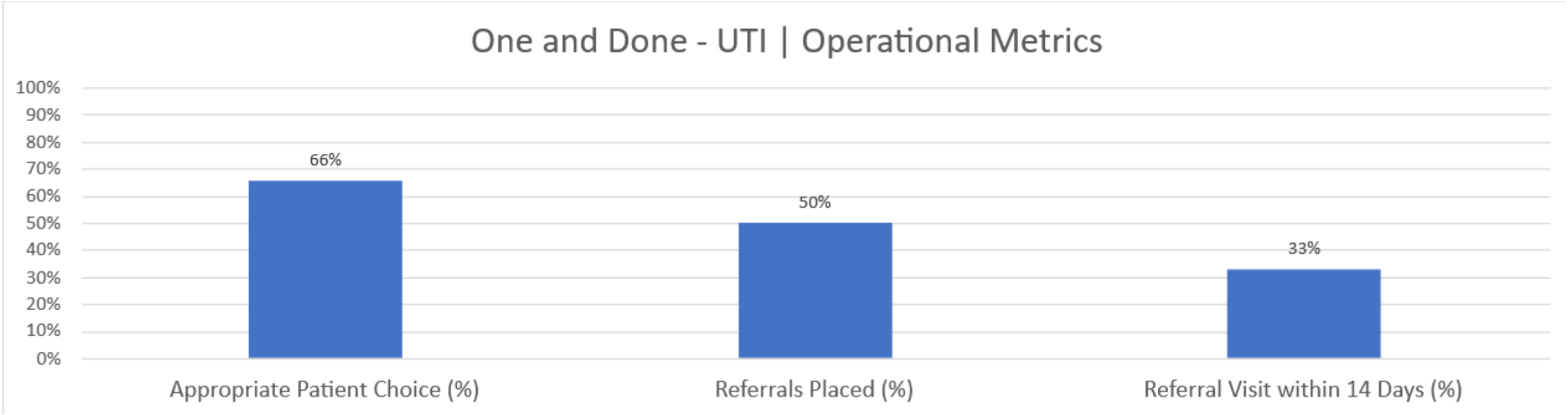
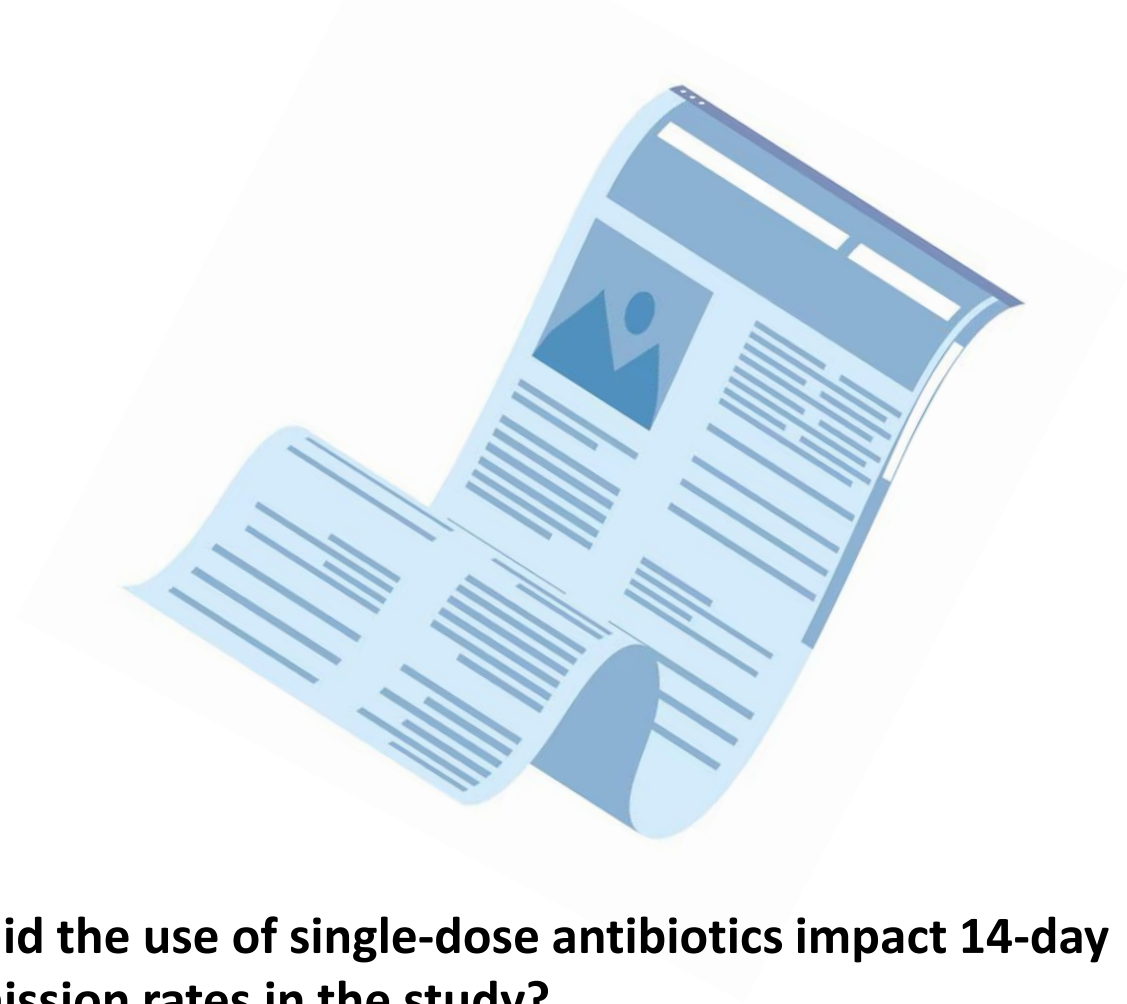


Preliminary Findings

One and Done - Dalbavancin System Wide Financials	
Admissions Avoided (#)	**Cost Savings ($)**
45	$225,800
Drug Specific Reimbursement Finalized (#)	**Net Reimbursement ($)**
45	$81,000

One and Done - UTI System Wide Financials	
Admissions Avoided (#)	**Cost Savings ($)**
62	$289,000

Knowledge Check



How did the use of single-dose antibiotics impact 14-day readmission rates in the study?

A) Increased readmission rates
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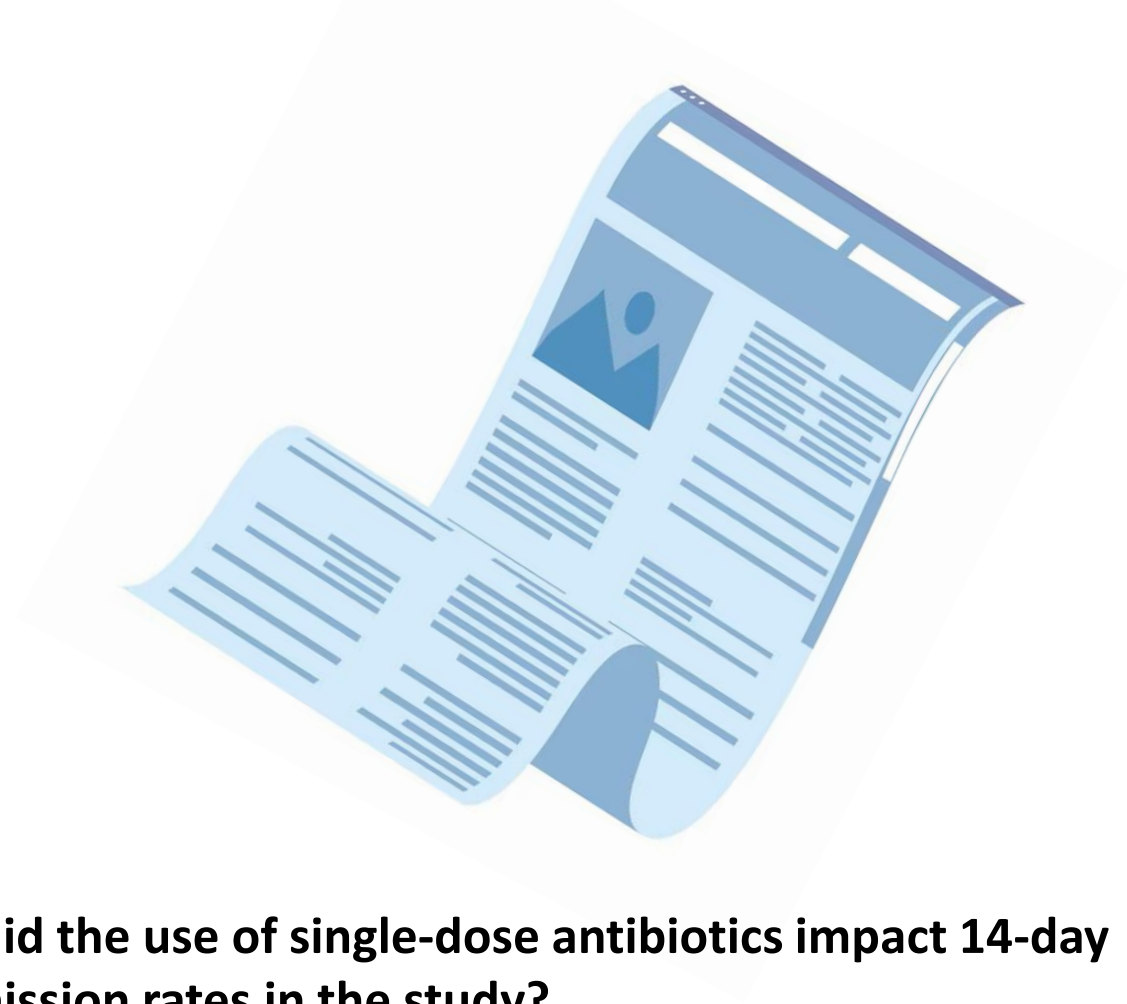
D) Inconsistent effect on readmission rates

Knowledge Check



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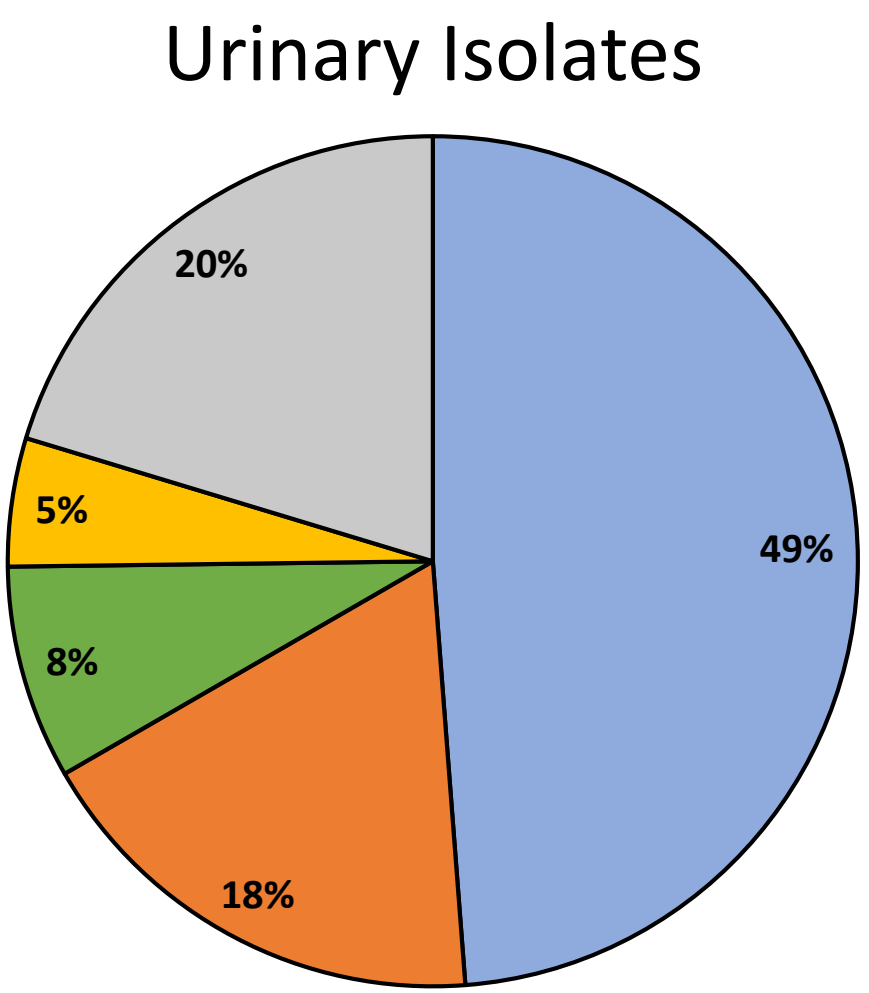
Multi-Center Study

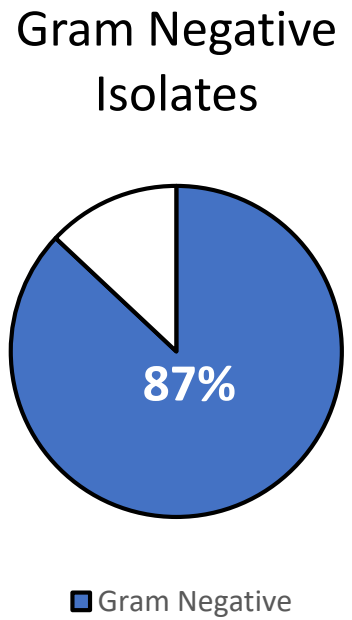
Table 2. Study Criteria
Population (N=359)
Inclusion Criteria: •Patients ≥ 18 years old •Received one-time dose through order set
Exclusion Criteria: •Hemodynamic instability (severe sepsis, septic shock, bacteremia, necrotizing fasciitis, endocarditis) •Catheter-site or device related infection •Deep-seated infections (Osteomyelitis) •Positive blood cultures •Currently receiving immunosuppression therapy or chemotherapy •Signs or suspicion of pyelonephritis •History of kidney transplant •Non-outpatient status at time of drug administration
Intervention: Treatment and discharge of stable patients who received a one-time dose per protocol for treatment of SSTI or cystitis **Comparator:** Established literature readmission rate

Multi-Center Study

Table 3. Baseline Characteristics		
Characteristic	**Dalbavancin (n=182)**	**Gentamicin (n=177)**
Sex Female, n (%)	74 (41)	128 (72)
Age, mean	53	67
Race, n (%) African American Caucasian Other	 43 (24) 128 (70) 11 (6)	 82 (46) 92 (52) 3 (2)
Payor Status, n (%) Commercial Medicare Medicaid Other	 34 (19) 60 (33) 64 (35) 24 (13)	 21 (12) 125 (71) 25 (14) 4 (2)

Multi-Center Study



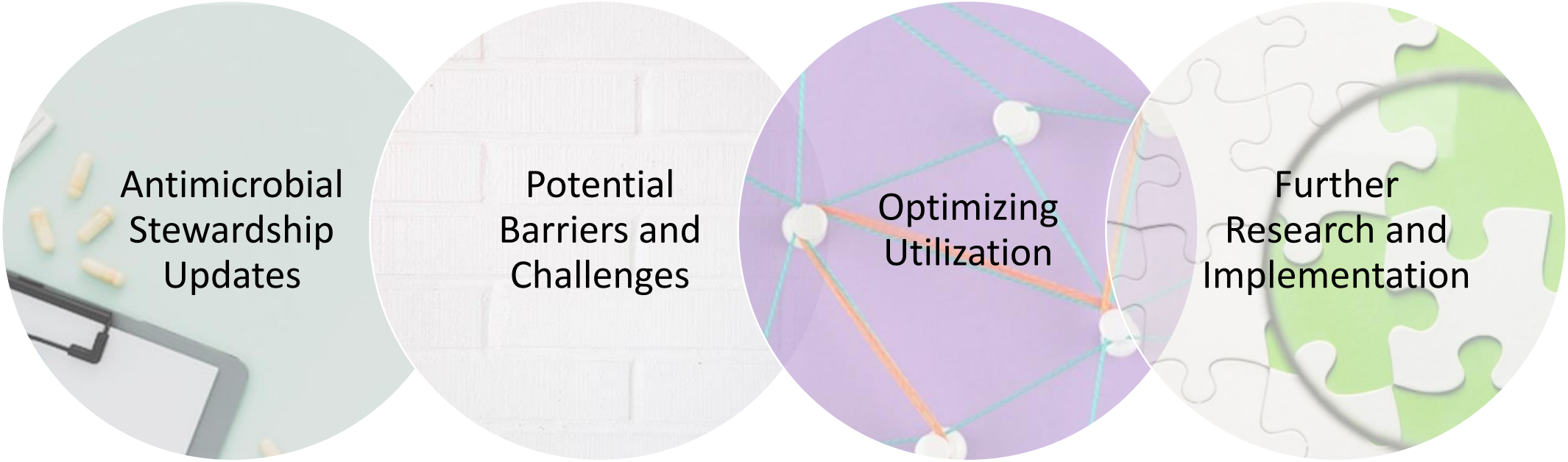


Multi-Center Study

Table 4. Outcomes		
Outcome	**Dalbavancin (n=182)**	**Gentamicin (n=177)**
Primary Endpoint:		
Cost avoidance	$694,823	$604,580

Future Implications for Antimicrobial Stewardship

What Next?


Antimicrobial Stewardship Updates
Potential Barriers and Challenges
Optimizing Utilization
Further Research and Implementation

Summary

Single dose treatment with dalbavancin for SSTI and gentamicin for UTI offers coverage of most common bacterial organisms

Patient Benefits

- Admission avoidance
- Cost savings
- Convenience (i.e. no additional oral antibiotics)

Clinician Benefits

- Rapid, effective treatment for stable patients with cellulitis
- Patients who will have difficulty adhering to traditional regimens due to socioeconomic, physiological or other health or clinical factors have a new treatment option
- Improve throughput

System Benefits

- Reduced admission and readmission rates
- Cost savings

References and Resources

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Brett Dragomer, PharmD, BCPS, BCIDP
Audry Barrera, PharmD; PGY2 – HSPAL Resident
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