2018

Impact of restriction criteria on optimal ertapenem use in a community health system

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Impact of Restriction Criteria on Optimal Ertapenem Use in a Community Health System

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The speaker has no actual or potential conflict of interest in relation to this presentation.

Background

- Ertapenem is a convenient option for empiric treatment and surgical prophylaxis
  - More costly than suitable alternatives

- Parkview implemented ertapenem restriction in November 2020 as a departmental improvement initiative

Standard cost of therapy per day	
Ertapenem	$56.23
Meropenem	$17.28
Levofloxacin + metronidazole	$6.50
Ceftriaxone + metronidazole	$6.76
Piperacillin-tazobactam	$9.87
Cefepime + metronidazole	$8.84

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Restriction Process

October 13, 2020

P&T approved restriction

November 12, 2020

Restriction went live

December 4, 2020

Replaced ertapenem order with new order panel within order sets

Integration of restriction into EPIC

October 26, 2020

Ertapenem removed from preferences/quick lists

November 18, 2020

Ertapenem Restriction Criteria

- Inpatient orders for ertapenem will only be accepted for patients who meet the following criteria:
  - **Empiric therapy:**
    - Documented history of infection with ESBL-producing bacteria at any anatomical site within the past twelve months
    - Necrotizing pancreatitis confirmed by imaging
    - Severe community acquired pneumonia without Pseudomonal risk in patients with a severe penicillin or cephalosporin allergy
    - Colorectal surgery prophylaxis in patients with documented severe penicillin or cephalosporin allergy

Ertapenem Restriction Criteria

- Inpatient orders for ertapenem will only be accepted for patients who meet the following criteria:
  - **Definitive therapy:**
    - Treatment of infection caused by ESBL-producing bacteria
    - Treatment of infection caused by *Enterobacter* species, *Klebsiella* aerogenes, *Citrobacter* species, *Morganella* species or *Serratia* species
    - Inpatient orders placed by an Infectious Diseases physician for patients who will be discharged on ertapenem for outpatient **parenteral** antimicrobial therapy

Study Purpose & Rationale

Evaluate the implementation of ertapenem restriction

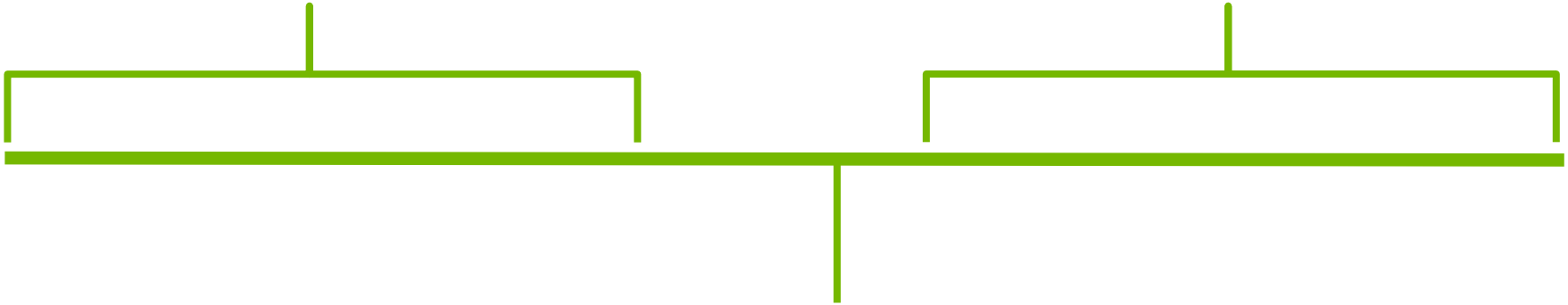
Identify the main indications of ertapenem use within the health system

Assess the potential for cost savings

Methods - Overview

Pre-implementation period
May 1, 2020 – November 1, 2020

Post-implementation period
December 1, 2020 – June 1, 2021



Implementation of restriction criteria
November 12, 2020

Inclusion/Exclusion Criteria

Inclusion

- Receiving at least one dose of ertapenem during hospitalization as empiric or definitive therapy

Exclusion

- Outpatient infusions for ertapenem

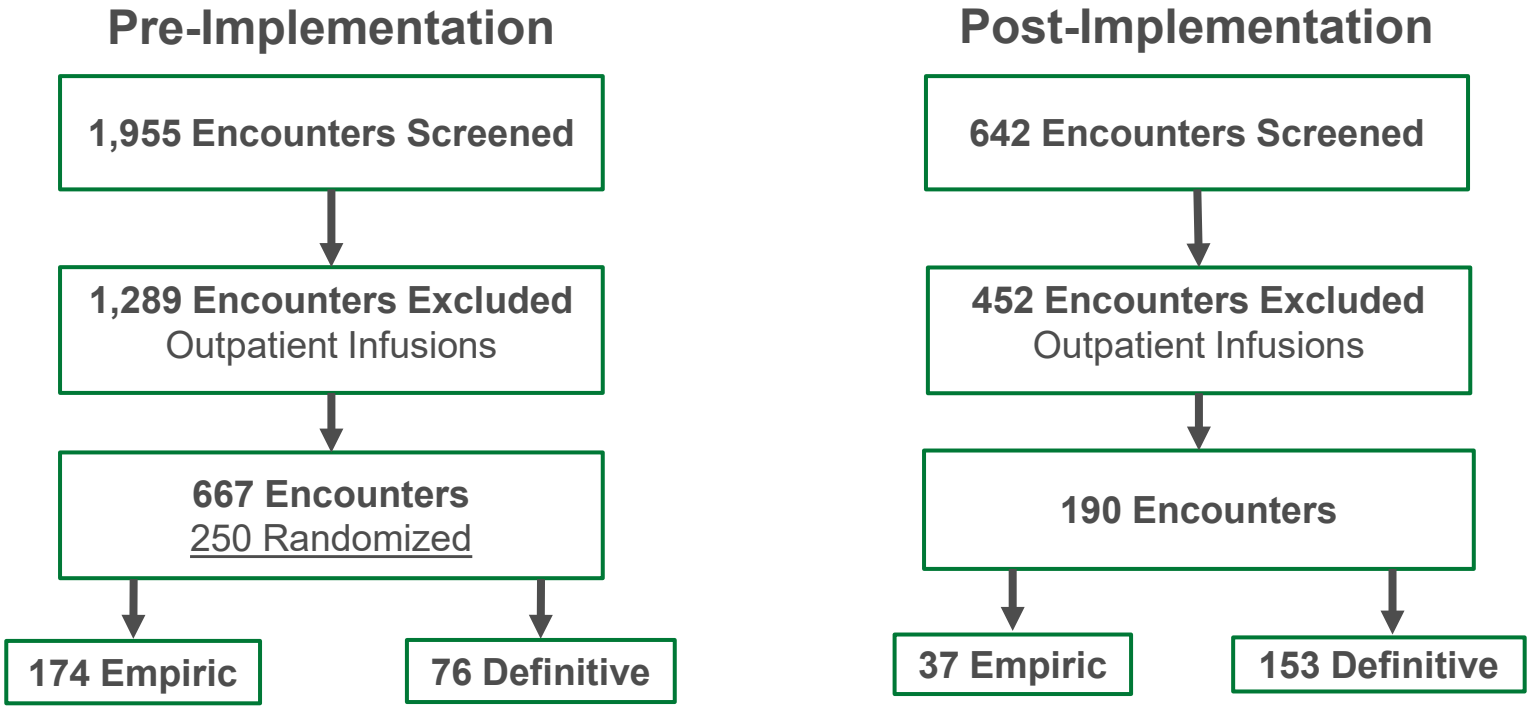
Study Definitions	
Empiric	Ertapenem use before relevant cultures have resulted, or as prophylaxis for surgery
Definitive	Ertapenem initiated after relevant culture results available

Outcomes

- **Primary outcome:**
  - Percent change of ertapenem orders considered optimal before and after implementation of restriction criteria
    - **Optimal use:** Matching an indication listed in the restriction criteria

- **Secondary outcomes:**
  - Percent change of ertapenem orders considered optimal for empiric and definitive therapy
  - Indications of any suboptimal use after implementation
  - Selected antibiotic use (ertapenem, levofloxacin, and meropenem)
  - Cost reduction estimate analysis

Patient Inclusion



Baseline Characteristics

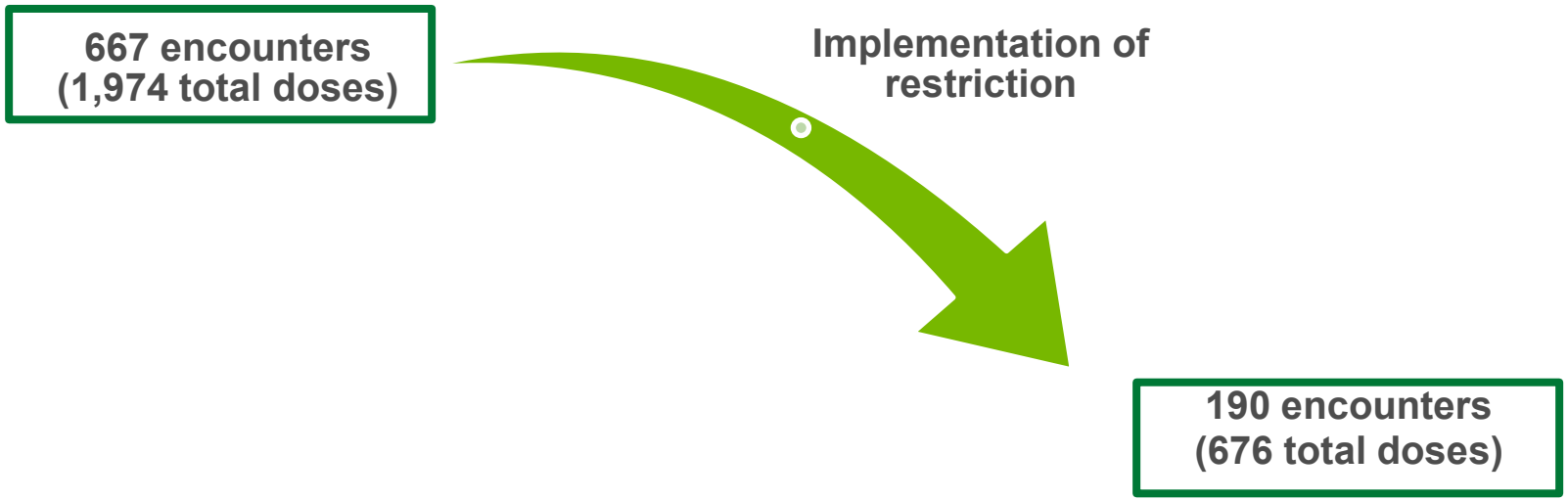
Characteristic, mean (± SD or %)	Pre-Implementation (n = 250)	Post-Implementation (n = 190)
Age	51.9 (± 21.3)	60.9 (± 16.2)
Male (n, %)	126 (50.4%)	89 (46.8%)
Doses of ertapenem per encounter	3 (± 4.9)	3.6 (± 3.9)
Length of stay in days	5.5 (± 8.2)	9.1 (± 9.0)
Severe allergies (n, %)		
Penicillin	52 (20.8%)	20 (10.5%)
Cephalosporin	21 (8.4%)	6 (3.2%)

Ertapenem Indication

Indication, n (%)	Pre-Implementation (n = 250)	Post-Implementation (n = 190)
Intraabdominal infection	68 (27.2%)	29 (15.3%)
Appendicitis	45 (18.0%)	4 (2.1%)
Urinary tract infection	34 (13.6%)	39 (20.5%)
Surgical prophylaxis (primarily colorectal)	27 (10.8%)	6 (3.2%)
Bloodstream infection	23 (9.2%)	23 (12.1%)
Skin or soft tissue infection	19 (7.6%)	11 (5.8%)
Bone or joint infection	15 (6.0%)	51 (26.8%)
Pneumonia	7 (2.8%)	11 (5.8%)
Other	12 (4.8%)	16 (8.4%)

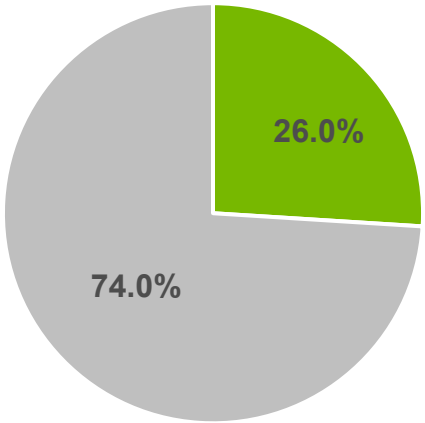
*Other indications include infective endocarditis, empyema, fever of unknown etiology, etc.

Impact of Restriction Criteria



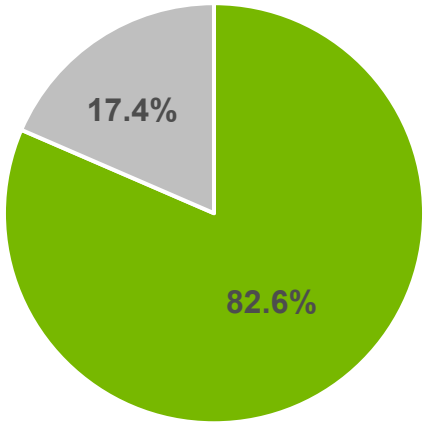
Primary Outcome – Optimal Use

Pre-Implementation (n=250)



Percent difference: 56.6%
P < 0.001

Post-Implementation (n=190)



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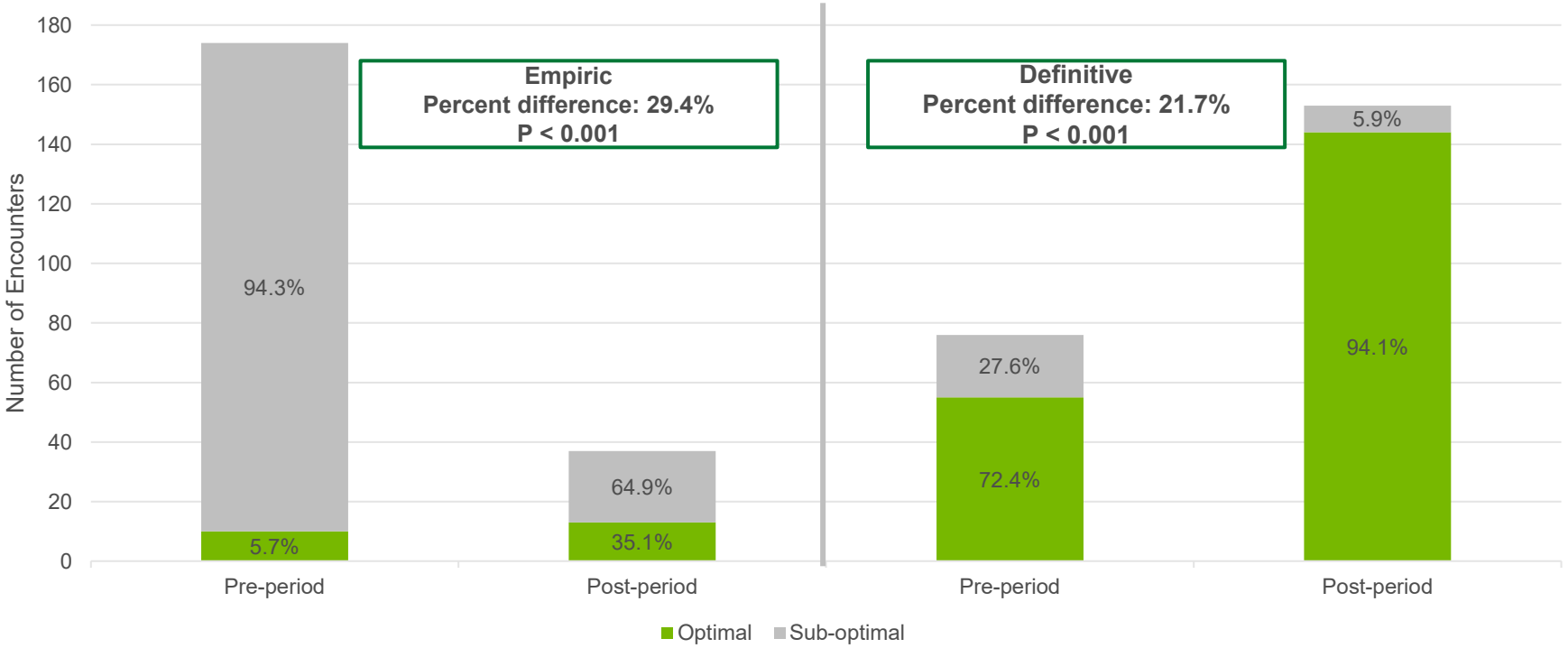
Secondary Outcome – Empiric and Definitive Therapy



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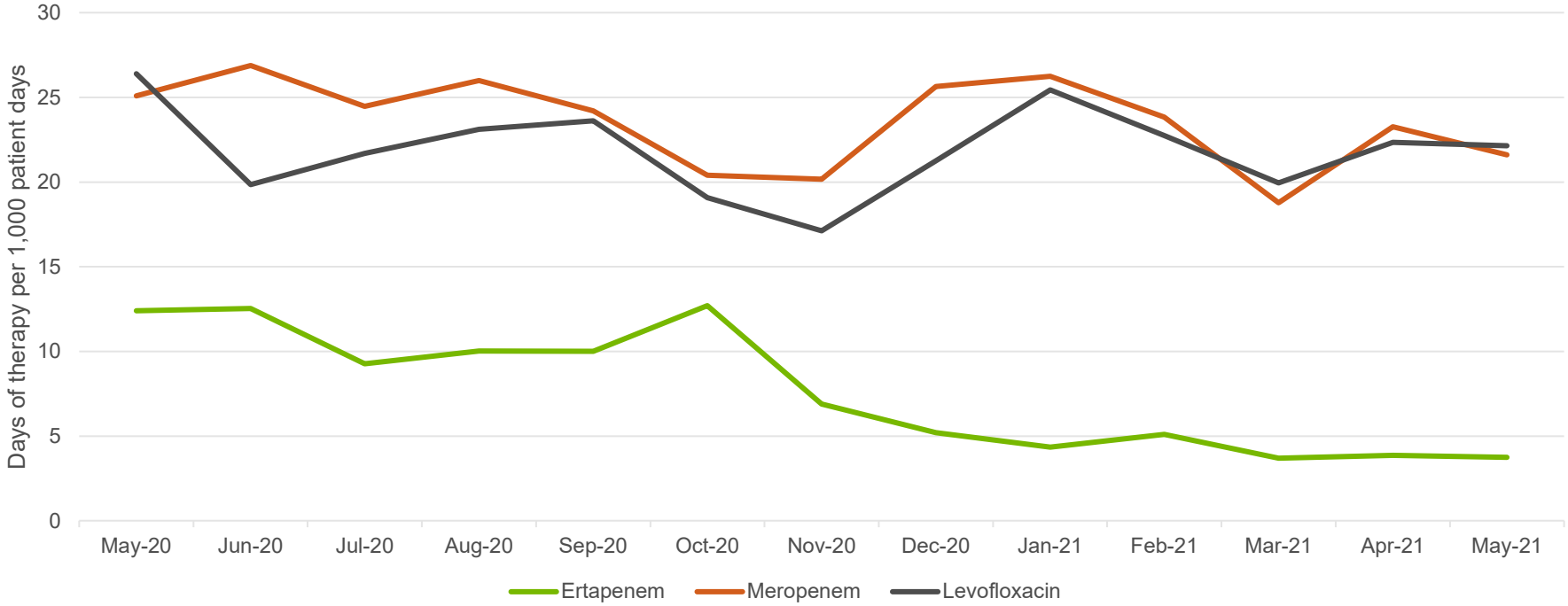
Suboptimal Indications Post-Implementation

Suboptimal Empiric Indication (n=24)	Number of encounters, n (%)
Bone or joint infection	7 (29.1%)
Appendicitis	4 (16.7%)
Intraabdominal infection	4 (16.7%)
Surgical prophylaxis	3 (12.5%)
Pneumonia	2 (8.3%)
Infective endocarditis	1 (4.2%)
Fever	1 (4.2%)
Lung abscess or empyema	1 (4.2%)
Skin or soft tissue infection	1 (4.2%)

Suboptimal Definitive Indication (n=9)	Number of encounters, n (%)
Intraabdominal infection	5 (55.6%)
Bone or joint infection	2 (22.2%)
Urinary tract infection	2 (22.2%)

Secondary Outcome – Antibiotic Usage



Secondary Outcome – Cost Reduction Estimate

	Total days of therapy	Difference in days of therapy	Cost of ertapenem	Cost of levofloxacin + metronidazole*	Cost of meropenem**	Range of cost savings
Pre-implementation	1,974	1,298	$73,376	$8,437	$22,417	**$50,959 – $64,939**
Post-implementation	676					

*The least expensive alternative to ertapenem on Parkview formulary
**The most expensive alternative to meropenem on Parkview formulary

Discussion

- Decreased ertapenem use overall
  - No sustained increase in meropenem or levofloxacin
- Major improvement in optimal orders after implementation
  - Decreased use for intrabdominal infections and appendicitis
- Estimated cost savings up to $64,000

Future Direction

- Update current restriction criteria to address unique clinical situations found during study time frame
  - Address continuation of ertapenem from OPAT on admission
  - Clarify appropriate definition of colorectal surgery prophylaxis
- Pharmacist education to ensure compliance with policy
- Develop manuscript and seek publication
  - Serve as a guide for other institutions
  - Share challenges encountered

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