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Implementation of a pharmacist-guided procalcitonin protocol in a community hospital

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Implementation of a Pharmacist-Guided Procalcitonin Protocol in a Community Hospital

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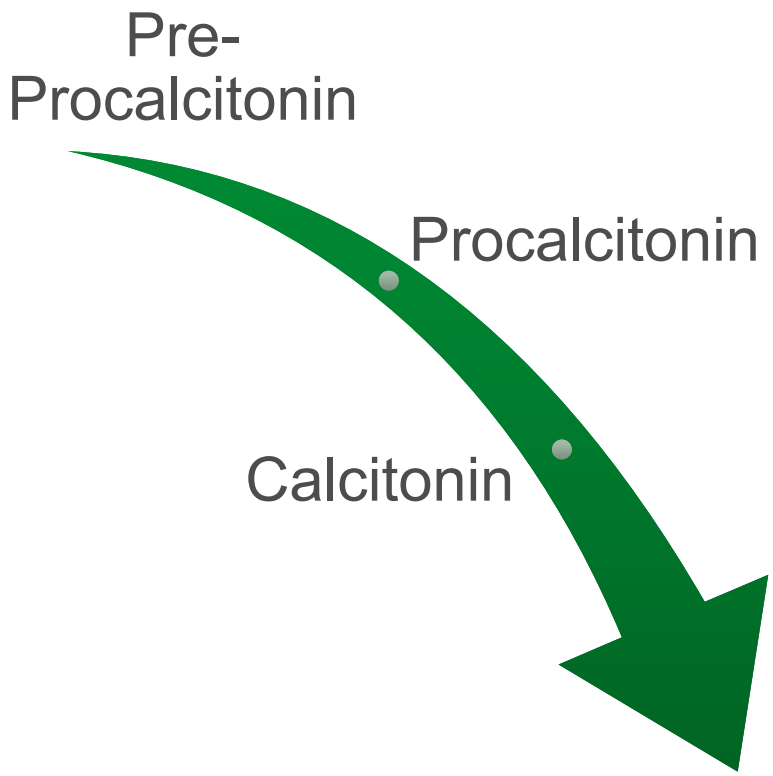
The speaker has no actual or potential conflict of interest in relation to this presentation

Procalcitonin Pathophysiology - Normal



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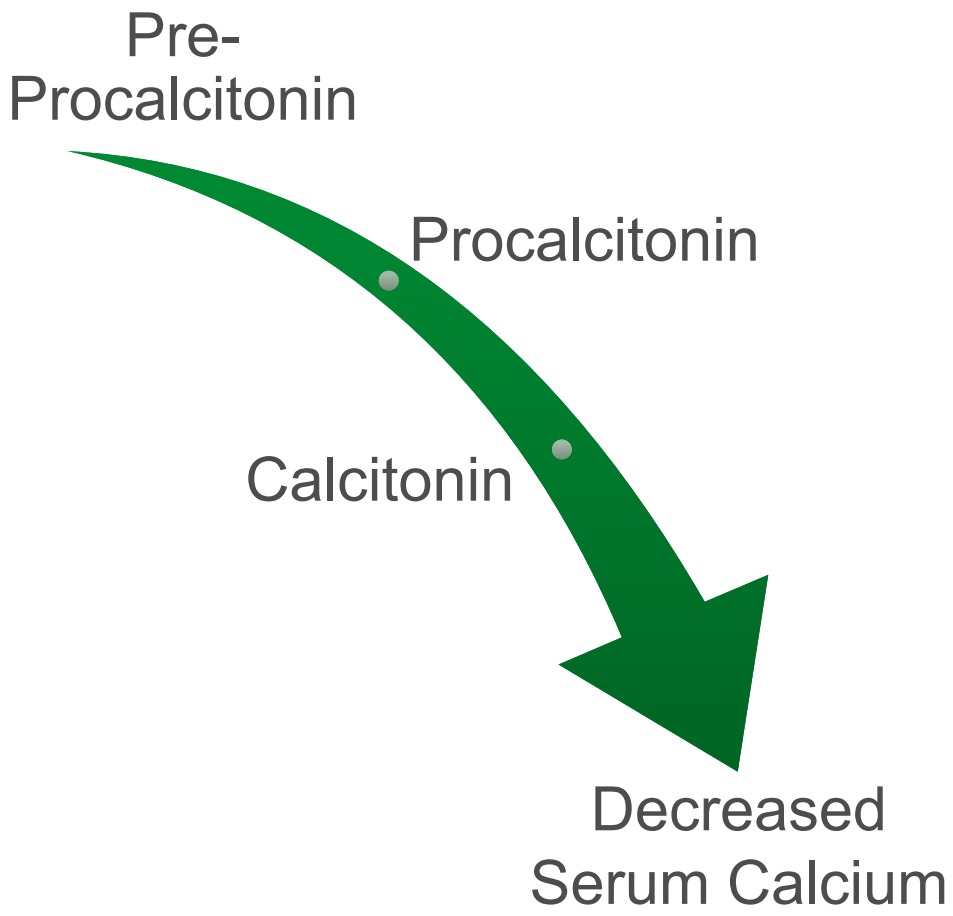
Linscheid P, et al. *Endocrinology*. 2003.

Procalcitonin Pathophysiology - Normal



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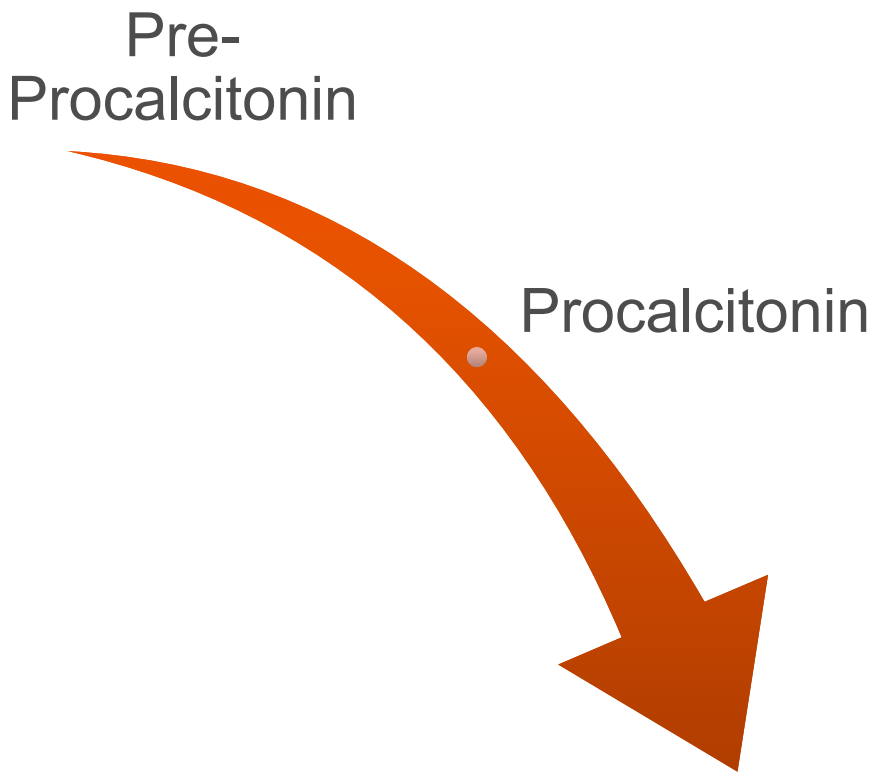
Procalcitonin Pathophysiology - Infection



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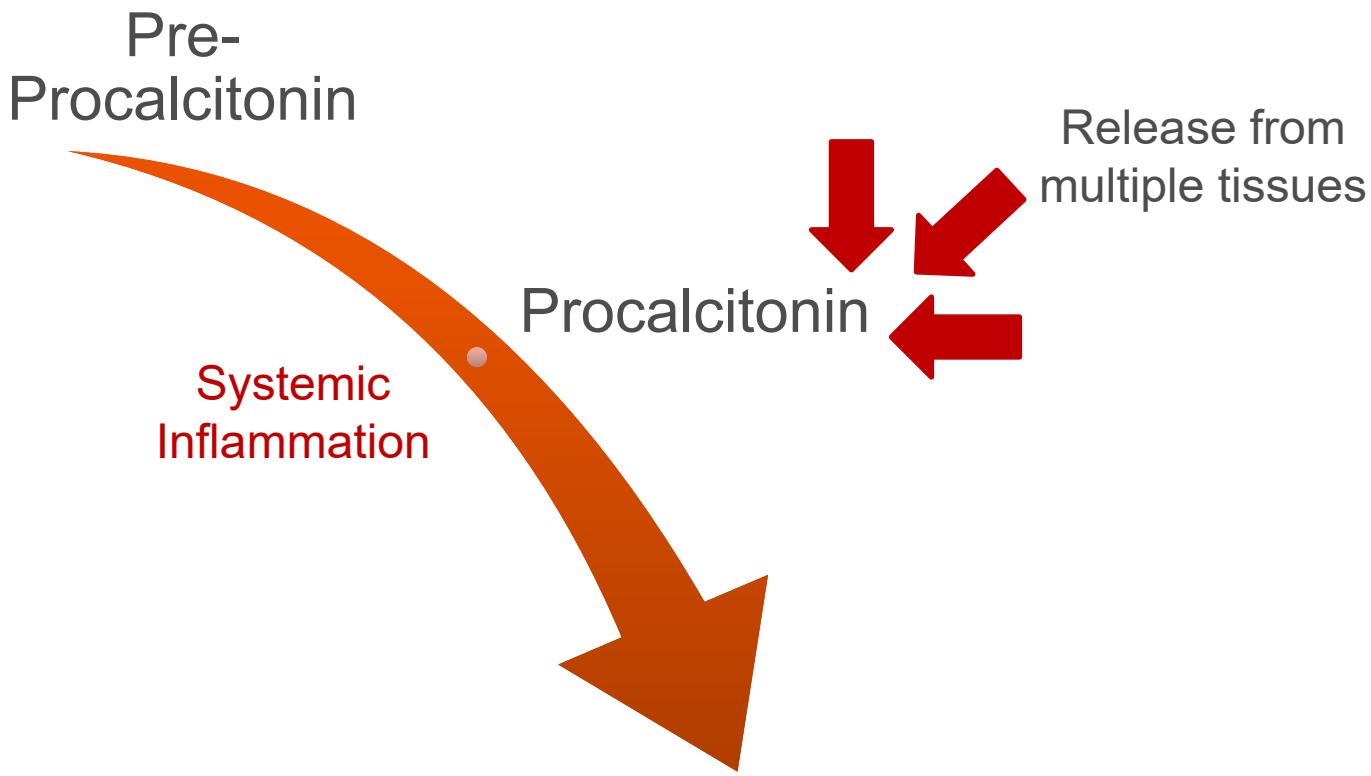
Procalcitonin Pathophysiology - Infection



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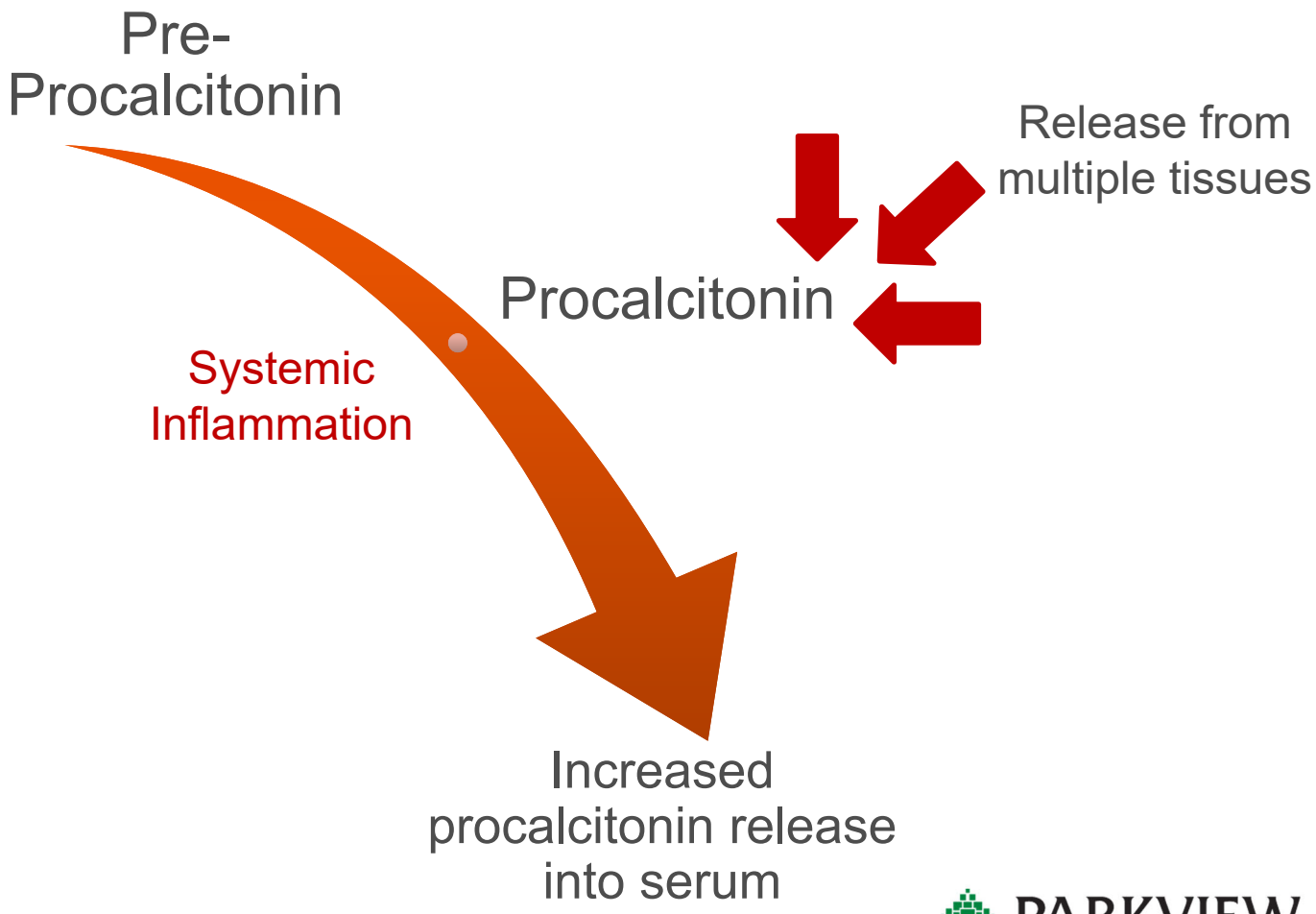

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Linscheid P, et al. *Endocrinology*. 2003.

Potential Causes of Procalcitonin Elevation

- Infection
- Surgery
- Cardiac Shock
- Burns
- Trauma
- ESRD/HD

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Gilbert DN, et al. *J Clin Microbiol*. 2010.

Assessment Question

The use of procalcitonin as a predictive biomarker has most extensively been studied in which disease states?

A. Bacteremia and upper respiratory tract infection
B. Sepsis and lower respiratory tract infection
C. Cellulitis and sepsis
D. Meningitis and UTI

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Role in Therapy

- Bacterial infections
  - Sepsis
  - Septic shock
  - Lower respiratory tract infections (LRTI)
    - Community-acquired pneumonia (CAP)
    - Healthcare-associated pneumonia (HCAP)
    - Ventilator-associated pneumonia (VAP)

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De Jong, et al.

- Prospective, multi-center, randomized, controlled trial
- Utilized non-binding advice
  - Discontinue antibiotics if procalcitonin decreased by 80% or more of its peak value or to 0.5 mcg/L or lower.
- Results
  - Median duration of treatment: 5 days vs. 7 days
  - Mortality at day 28: 20% vs. 25%

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De Jong E, et al. *Lancet Infect Dis.* 2016.

Lam, et al.

- Systematic review, meta-analysis
- Included 15 randomized controlled trials
- Results
  - Mortality: RR 0.93
  - Difference in antibiotic duration:
    - Cessation trials: - 1.26 days
    - Mixed strategy trials: - 3.10 days
  - No difference in hospital or ICU length of stay

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Lam SW, et al. *Crit Care Med*. 2018.

Use of Pharmacist-Guided Protocols at Other Institutions

- Multiple institutions have instituted protocols for LRTI and sepsis
  - Nebraska Medicine and Washington Providence Medical Center
  - Align with other trials that have been done in this area

Nebraska Medicine.
Washington Providence Medical Center.

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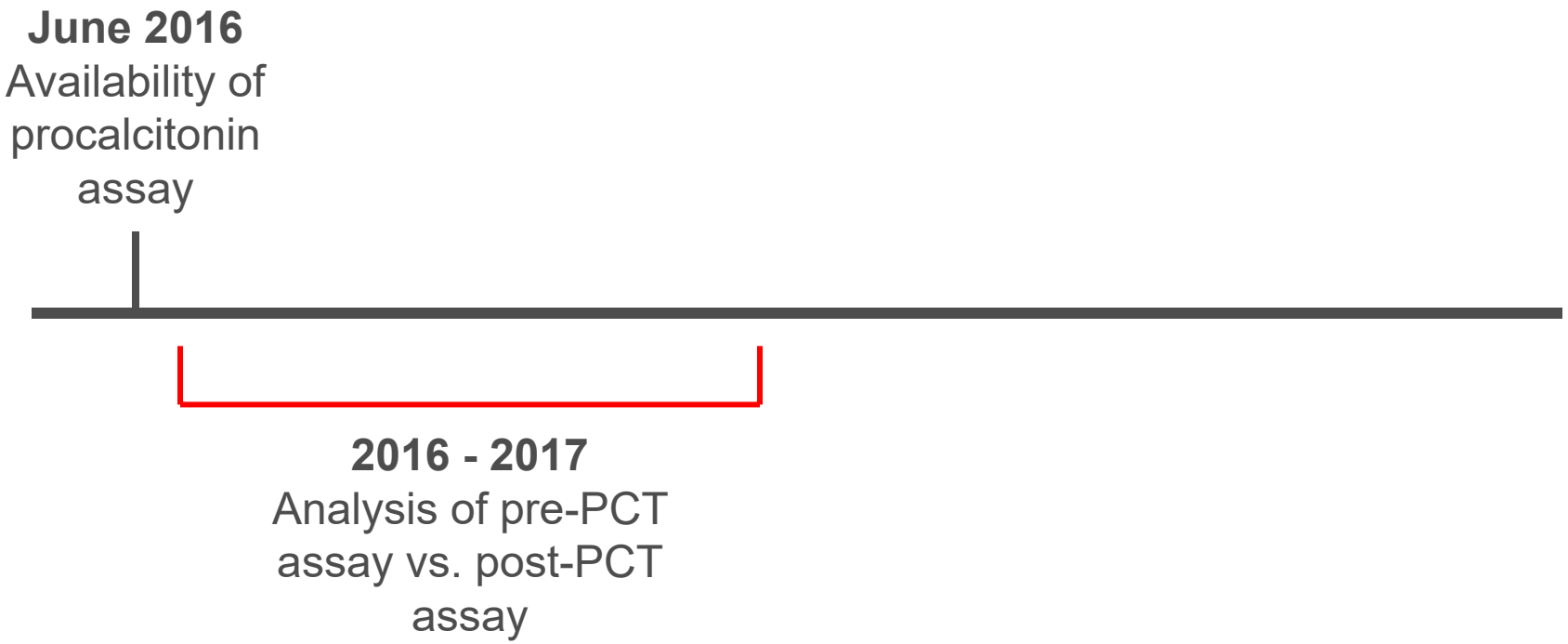
Procalcitonin Journey at Parkview



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PCT: Procalcitonin

Procalcitonin Journey at Parkview

- Pre-PCT assay vs. Post-PCT assay analysis showed:
  - Decreased length of antibiotic therapy
  - Decreased hospital length of stay
  - Decreased ICU length of stay

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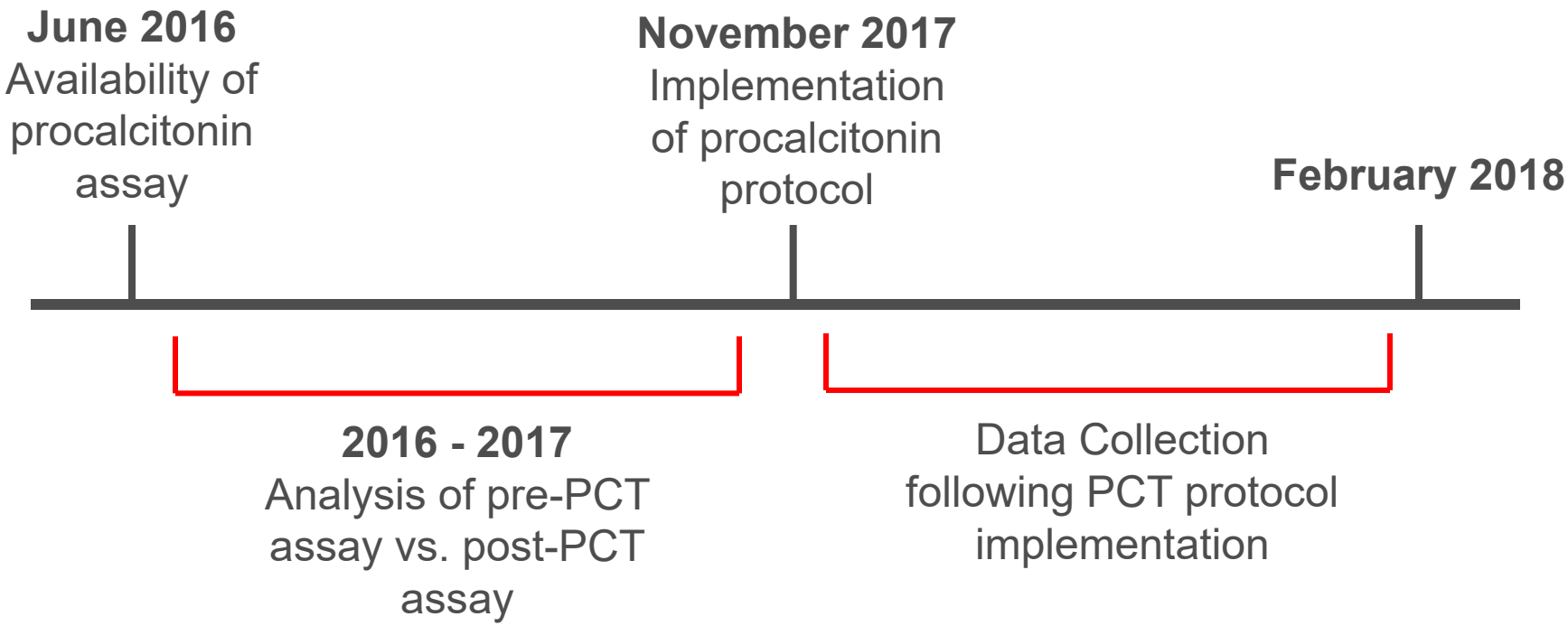
Procalcitonin Journey at Parkview



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Assessment Question

Which of the following could result from using procalcitonin levels to assist in guiding therapy?

A. Increased cost
B. Decreased need for physician monitoring of microbiology cultures
C. Increased ICU length of stay
D. Decreased length of antibiotic therapy

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Purpose

- To evaluate patient outcomes following implementation of a pharmacist-guided procalcitonin protocol
  - Antibiotic length of therapy
  - Hospital length of stay
  - ICU length of stay

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Parkview Regional Medical Center

- Parkview Health
- Community hospital
- Level II trauma center
- 6 intensive care units
- Included units
  - Medical ICU (MICU)
  - Surgical Trauma ICU (STICU)
  - Cardiovascular ICU (CVICU)
  - Cardiac ICU (CICU)
  - Progressive Care Unit

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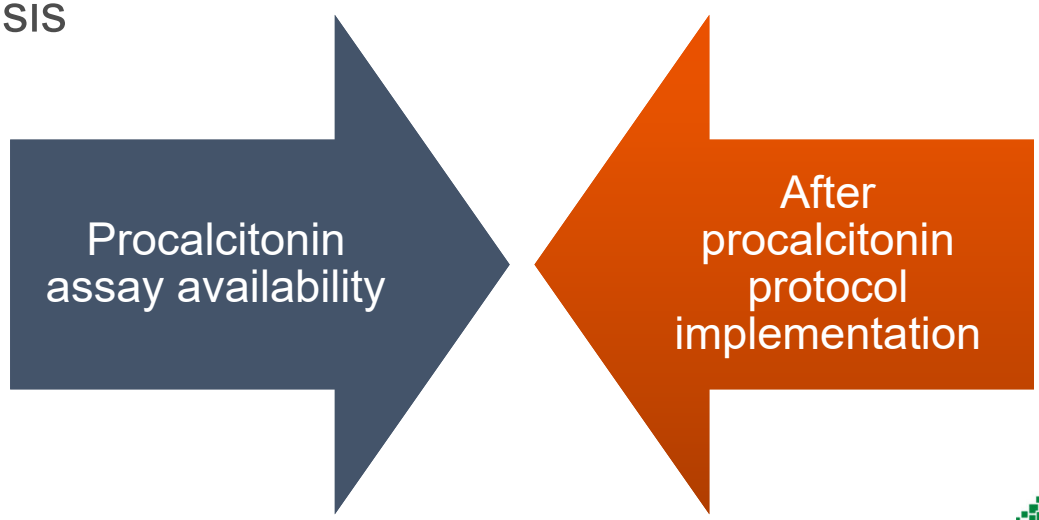
Study Design

- Retrospective chart review following protocol implementation
- Patients were matched on the following criteria:
  - Simplified Acute Physiology Score (SAPS II)
  - Age
  - Diagnosis



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Protocol Implemented – Sepsis

PCT < 0.25	PCT 0.25 – 0.49 Or Peak decrease by ≥ 80%	PCT ≥ 0.5 And Peak decrease by < 80%	PCT ≥ 0.5 And Rising/not decreasing
Discontinuation strongly encouraged	Discontinuation encouraged	Continuation encouraged	Continuation strongly encouraged

Consider continuing therapy if clinically unstable or positive cultures with known source of infection

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Protocol Implemented – LRTI

PCT < 0.1 or Peak decrease by > 90%	PCT 0.1 – 0.24 Or Peak decrease by > 80%	PCT ≥ 0.25 - 0.5	PCT > 0.5
Discontinuation strongly encouraged	Discontinuation encouraged	Continuation encouraged	Continuation strongly encouraged

Consider continuing therapy if clinically unstable or positive cultures with known source of infection

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Inclusion Criteria

- Age ≥ 18 years old
- Diagnosis of sepsis, septic shock, CAP, HCAP or VAP
- Admitted to a critical care unit for ≥ 48 hours
- Pharmacy-to-dose consult for management of antibiotics

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Exclusion Criteria

- Death during admission
- Infectious Disease consult for antibiotic therapy management
- Known concomitant infection other than those listed in inclusion criteria
- Receiving antibiotics for > 24 hours prior to first drawn PCT level
- Positive culture or known source of infection

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Objectives

- Primary Objective
  - Length of antibiotic therapy
- Secondary Objectives
  - Length of hospital stay
  - Length of ICU stay

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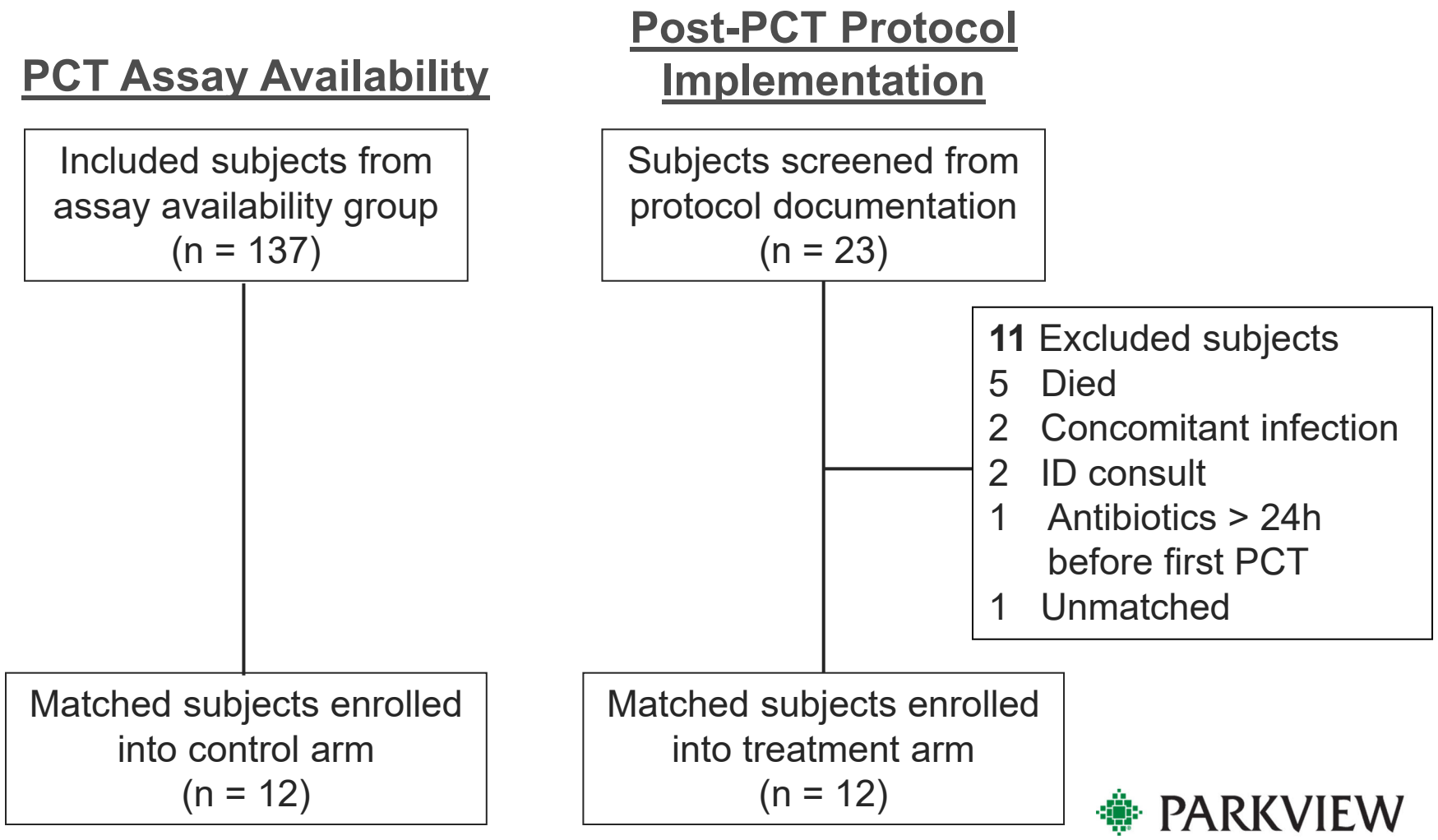
Study Population



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Baseline Characteristics

		PCT assay availability (n = 12)	Post-PCT protocol implementation (n = 12)
Age (years)	18-24:	0	0
	25-34:	0	0
	35-60:	5	5
	61-75:	4	4
	≥76:	3	3
Mean age (age ± SD)		**62.8 ± 13.5**	**64.7 ± 15.1**
SAPS II	≤29:	4	4
	30-40:	3	3
	41-52:	3	3
	53-64:	2	2
	≥65:	0	0
Mean SAPS II (score ± SD)		**38 ± 13**	**38.2 ± 12.8**

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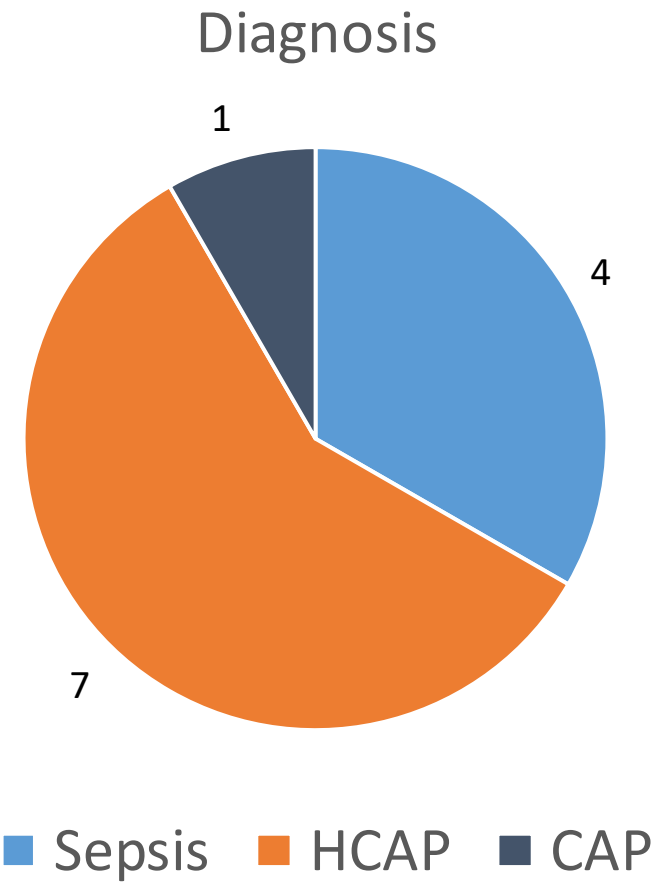
Baseline Characteristics



Note: No patients matched were diagnosed with septic shock or VAP

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Results – Primary Outcome

	PCT assay availability	Post-PCT protocol implementation	Significance P-value (95% CI)
Antibiotic length of therapy (days ± SD)	10.2 ± 5.7	5.2 ± 3.7	0.020 (0.89, 9.16)

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Results – Secondary Outcomes

	PCT assay availability	Post-PCT protocol implementation	Significance P-value (95% CI)
Hospital length of stay (days)	13.5 ± 5.8	12.1 ± 8.3	0.612 (-4.59, 7.59)
ICU length of stay (days)	6.2 ± 3.6	5.5 ± 3.8	0.659 (-2.46, 3.81)

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Intervention Acceptance Rate

- Most interventions resulted in de-escalation with eventual discontinuation
- 2 resulted in immediate discontinuation
- 2 were denied without further attempts

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Conclusions

- Pharmacy monitoring of PCT resulted in:
  - Decreased antibiotic therapy by 5 days
  - Decreased hospital length of stay by 1.4 days
  - Decreased ICU length of stay 0.8 days
- Pharmacists role
  - Monitoring and assessing PCT level trends
  - Making recommendations for discontinuation when necessary

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Limitations

- Retrospective chart review
- Small sample size
- High exclusion rate
- Lack of consistent staffing schedule

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Further Direction

- Continue data collection to obtain similar sample size to previous group
- Expand protocol use to other hospital areas
- Integrate PCT monitoring into daily work flow for clinical pharmacists
  - Potentially develop a monitoring flag on the electronic medical record
- Publication

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- Jared Netley, PharmD, BCPS
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