



Albany College of Pharmacy
AND HEALTH SCIENCES

Systems Approaches to Improving Sepsis Outcomes

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Overview

- Why a systems approach?
- Systems supporting sepsis management
- Recent advances within that system
- Future directions



Systems Defined

Albany, NY



Amsterdam, NL



	Albany	Amsterdam
City Planning	Suburban layout	Dense Urban Design
Non-Car Infrastructure	Limited bus and bike lanes	Bus, Light Rail, Subway, Bus Lane
Cost of ownership	Low gas tax, tax credits	High gas tax
Product	84% car ownership	25% car ownership

Sepsis Systems by Type

Type	Examples
Internal	Do clinicians have the appropriate level of knowledge for managing sepsis? Do clinicians' attitudes/beliefs/behaviors align with best practices?
Interpersonal	Does the nurse feel comfortable escalating to a physician? Are interdepartmental handoffs clear and timely? Is there psychological safety in huddles? Can pharmacists take a more active role in sepsis management?
Institutional	Do hospitals have guidelines for early recognition and management of sepsis? How can technology improve sepsis management? Do organizations perform CQI for sepsis?
Societal	Are there reporting requirements for sepsis outcomes? Are there regulations for sepsis management? Do the regulations improve sepsis outcomes? How do we minimize the societal impact of sepsis?

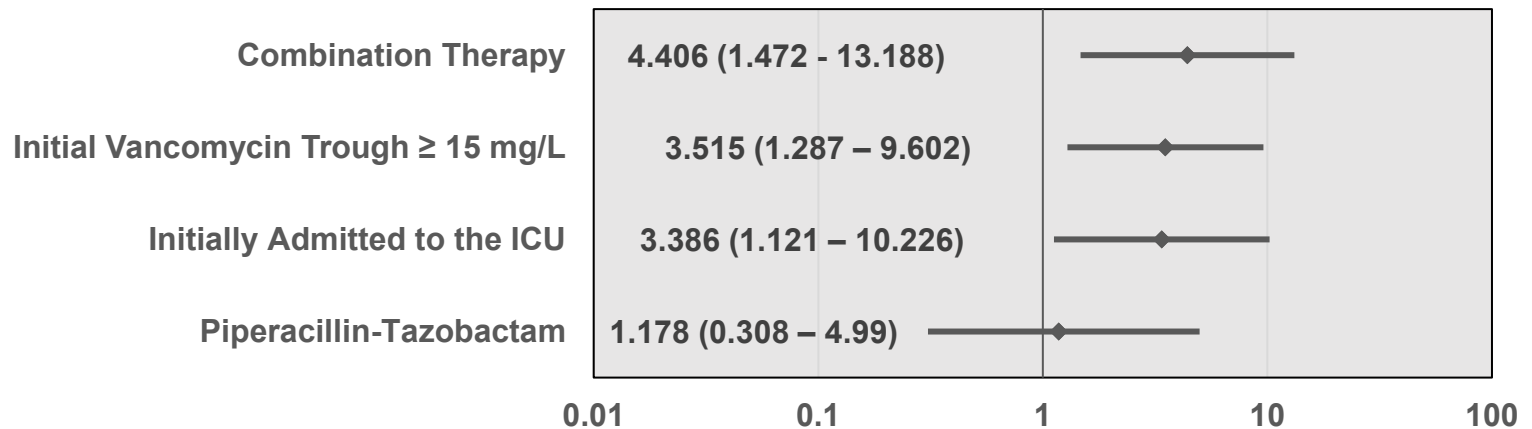


Pharmacists' role in sepsis

- Many different roles for pharmacists for both ICU pharmacists and infectious diseases pharmacists.
- Focus on:
 - Antimicrobial adverse effect prevention
 - Antimicrobial dosing



Acute Kidney Injury with a Common Combo (n = 213)¹



Citation	N	Group 1	Odds/Risk Ratio (95% CI)
Alaradi et al ²	23,794	VPT vs. VC	1.503 (1.221-1.849)
Alshehri et al ³	80,595	VPT vs. VM	1.55 (1.23-1.96)
Pan et al ⁴	76,638	VPT vs. VC	2.19 (1.38-3.47)
Pan et al ⁴	76,638	VPT vs. VM	1.38 (1.18-1.60)

VPT: Vanco + Pip-Tazo; VC: Vanco + Cefepime; VM: Vanco + Meropenem

Key Point: Vancomycin + Pip-Tazo increases risk of AKI

¹Carreno JJ et al. 2018 Nov;52(5):643-650. doi: 10.1016/j.ijantimicag.2018.08.001. Epub 2018 Aug 10.

²Alaradi et al. J Intensive Care Med. 2025 Mar 23;8850666251323265.

³Alshehri et al. BMC Infect Dis. 2025 Jan 7;25(1):36. doi: 10.1186/s12879-024-10227-0.

⁴Pan et al. J Antimicrob Chemother. 2025 Jan 3;80(1):47-58. doi: 10.1093/jac/dkae410.

Risk of AKI in MRSA bacteremia (N = 265)

AUC Range	OR	95% CI	aOR	95% CI
< 400	Ref	Ref	Ref	Ref
400 – 600	1.59	1.09 – 2.33	1.81	1.18 – 2.78
> 600	2.44	1.18 – 5.40	3.20	1.38 – 7.69
AUC = 24-hour Area Under the Concentration-Time Curve; OR = Odds Ratio; aOR = Adjusted Odds Ratio; CI = Confidence Interval				

- Initial meta-analysis of 4,231 suggested less vancomycin-induced AKI than trough-guided strategies (OR 0.625, 95% CI (0.469-0.834))
- Meta-analysis of 15,103 patients suggested lower prevalence (odds ratio: 0.53; 95% CI: 0.32–0.89) with AUC guided monitoring

Key Points: Use AUC dosing for vancomycin to minimize risk, but vancomycin has increased risk of AKI in therapeutic range compared to subtherapeutic range

How Can Technology Help in Sepsis?

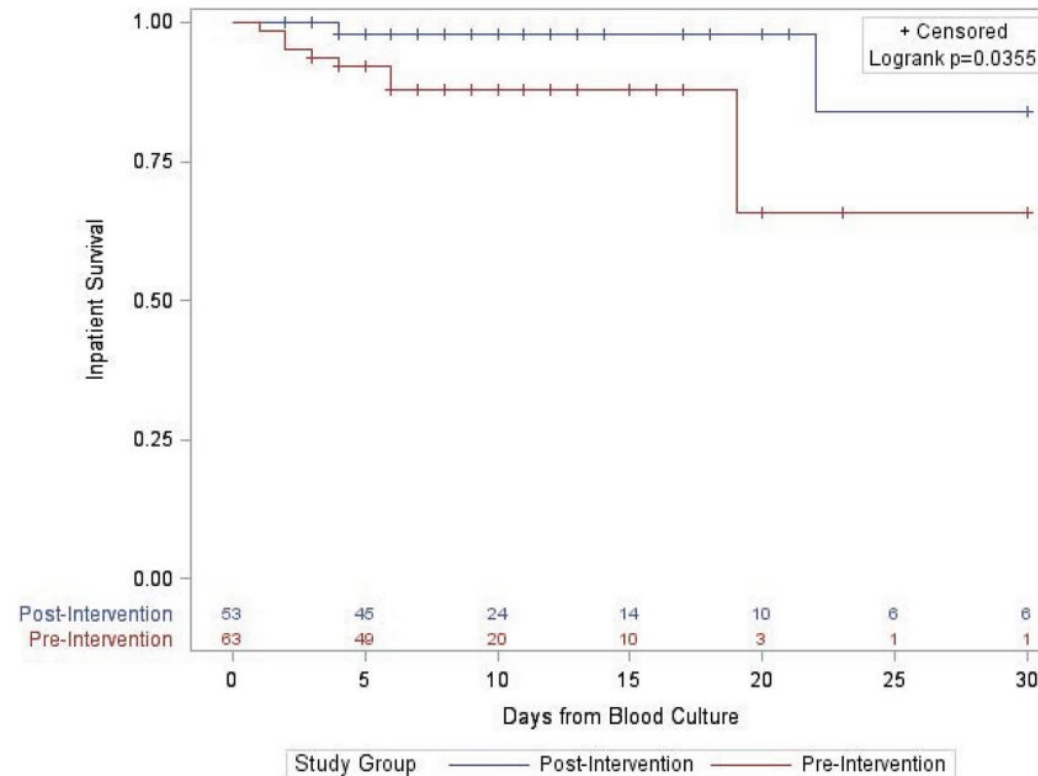
- Rapid Diagnostics examples:
 - MALDI-TOF
 - Accelerate
- Can be helpful component of system, but must include human element to *act on the results*



MALDI-TOF with ASP (N=394)

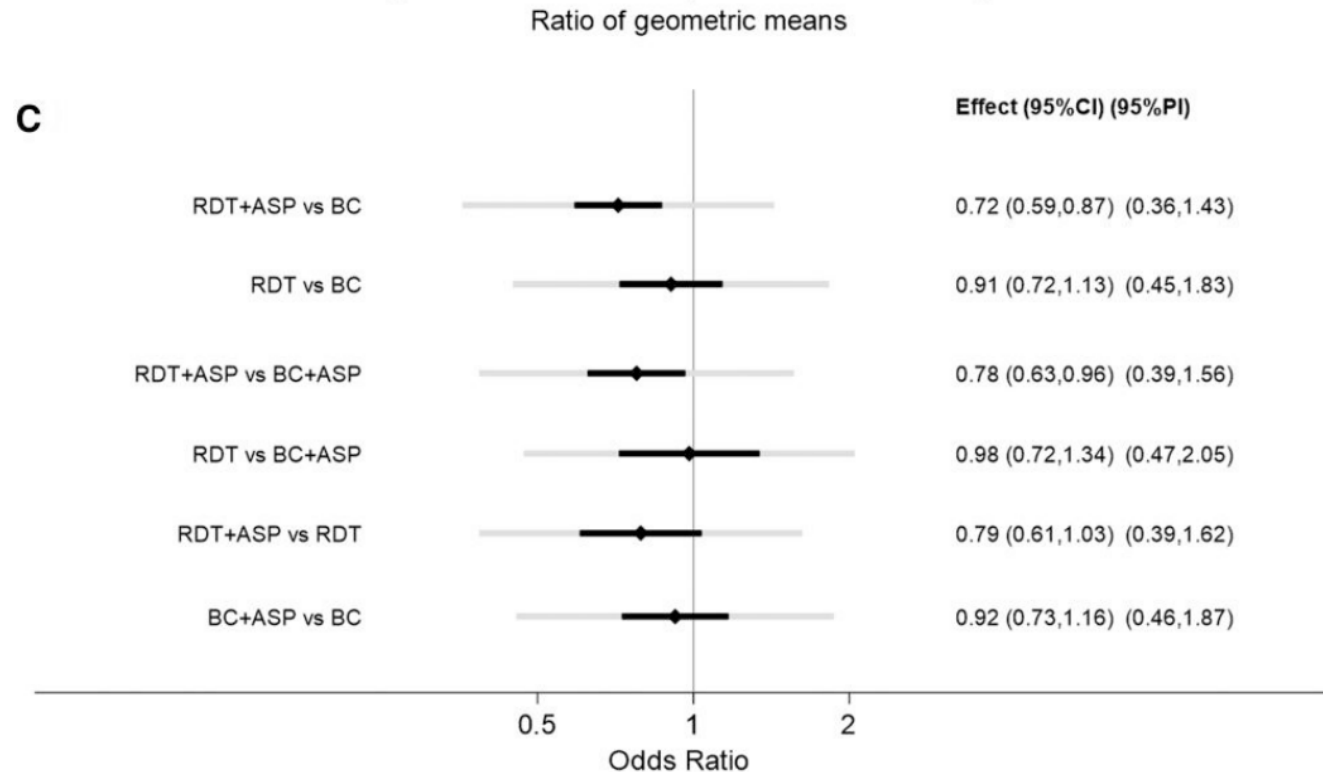
- Three year, prospective cohort of patients with sepsis and bacteremia.
- Multidisciplinary team led with pharmacy driven blood culture follow-up.
- Results:
 - Decreased time to organism identification (2.0, 0.9, 1.0, Y1, Y2, Y3, respectively, $P < 0.001$)
 - Increased probability of sepsis resolution (73.2%, 83.5%, and 88.5%, Y1, Y2, Y3, respectively, $P = 0.013$)
 - Improved time to clinical response in Y3 (HR: 1.388, 95% CI: 1.004 – 1.919)

Rapid Phenotypic Testing (N = 116)



- Two year follow up to MALDI-TOF study using rapid AST
- Results:
 - Decreased time to sensitivity 60.2h vs 30.6h
 - Decreased adjusted hazard for mortality (0.15 [0.026 – 0.846])

Meta Analysis of RDT (N = 25,682)



Key Point: rapid diagnostic tests should play an integral part of sepsis management

Peri AM et al. Clin Infect Dis. 2024 Aug 16;79(2):502-515. doi: 10.1093/cid/ciae234.

Market Disconnect

Market Summary > T2 Biosystems Inc

0.13 USD

+ Follow

-84,999.87 (-100.00%) ↓ all time

Jun 23, 4:00 PM EDT • Disclaimer

1D 5D 1M 6M YTD 1Y 5Y Max



Market Summary > Accelerate Diagnostics Inc

0.0056 USD

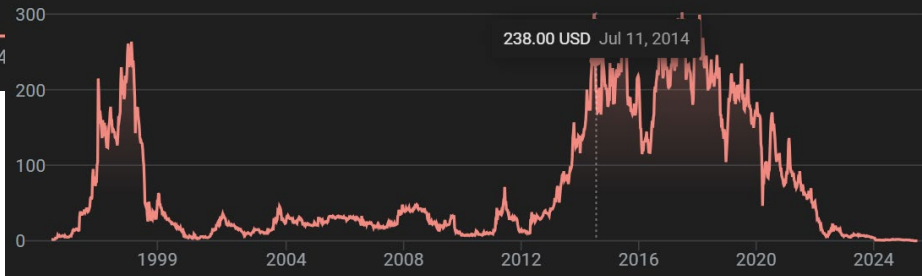
+ Follow

-1.99 (-99.72%) ↓ all time

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After hours 0.0094 +0.0038 (67.86%)

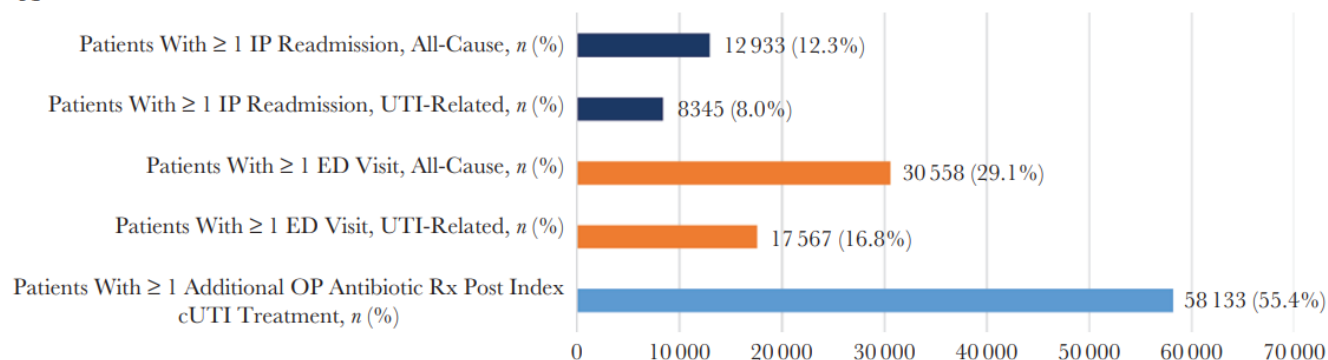
1D 5D 1M 6M YTD 1Y 5Y Max



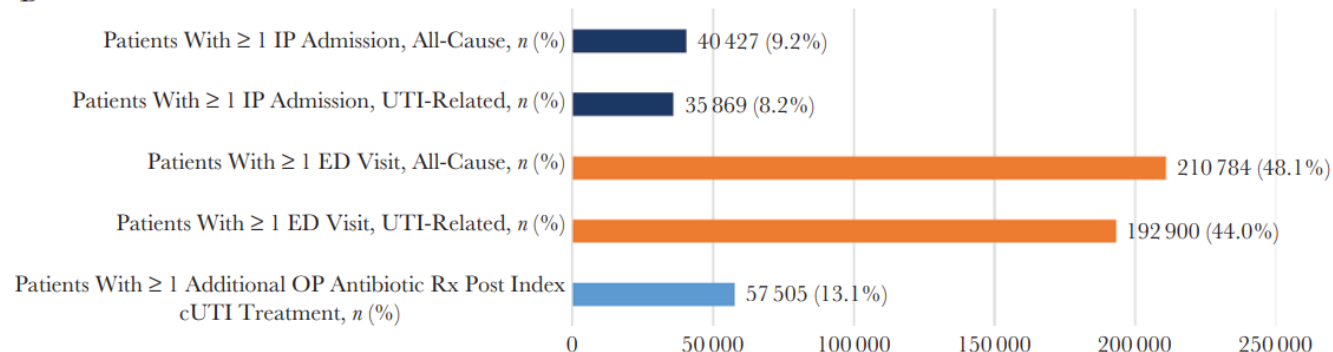
Key Question: Similar to new antibiotics, how do we ensure market forces support the adoption of these technologies?

US Societal Burden (N = 543,502)

A



B



Societal Impact on New York State

- Community isolates of *E. coli* in NYS has resistance to common outpatient medications¹ (N = 78,078 isolates)
 - 23% to ciprofloxacin
 - 27% to TMP-SMX
 - 3% to NTF
- Older adults often (56.2%) receive guideline discordant antibiotic prescription.² (N = 50,658)
- The combination of guideline discordant prescribing and AMR is associated with increased risk of severe UTI (e.g. sepsis) and increase rate hospital admission for UTI.³ (N = 14,474 and N = 2,972,174)
- **Key Point:** Opportunity for sepsis prevention = better management of outpatient UTI and more drug development for outpatient UTI.

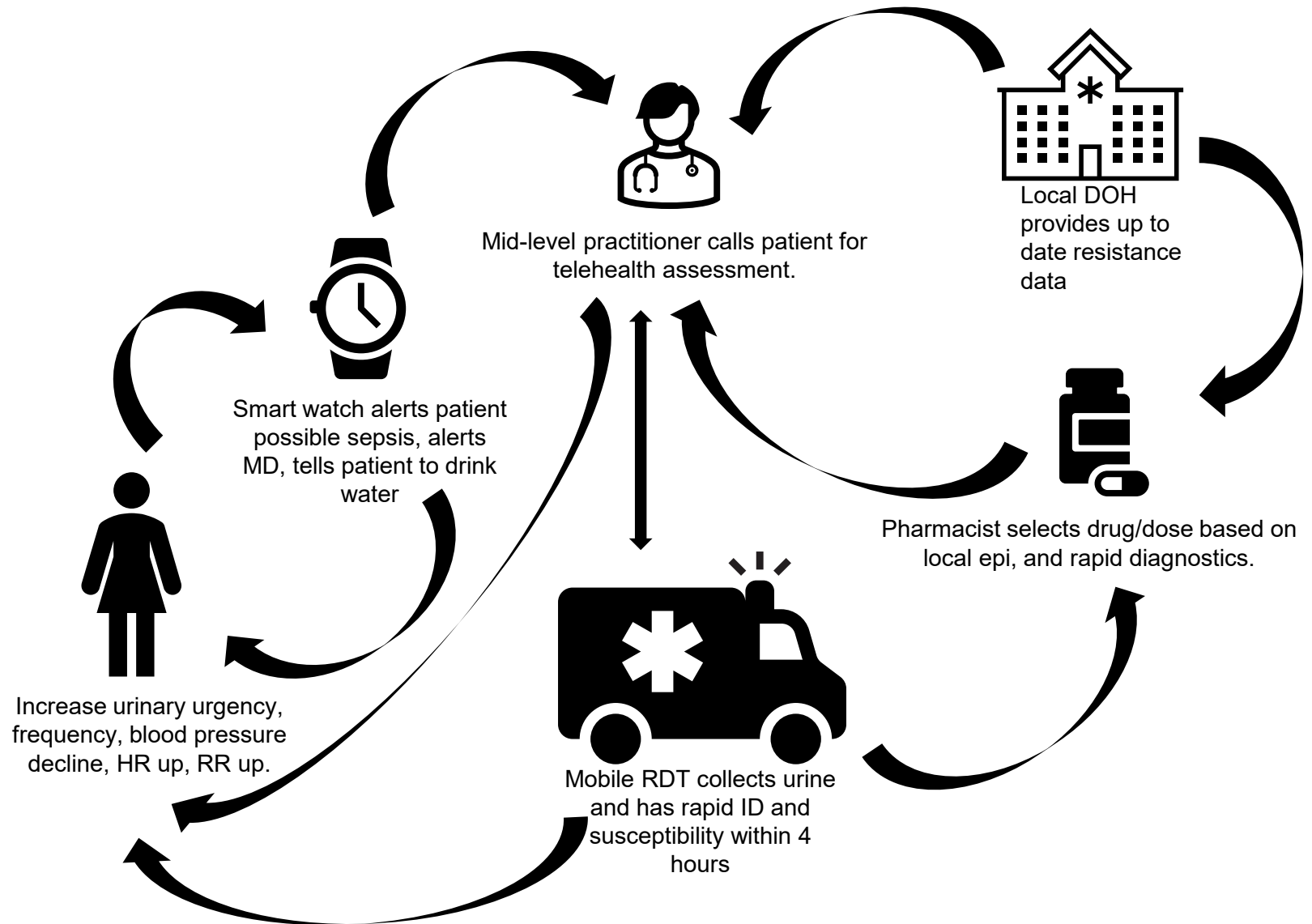
¹Rank et al. Open Forum Infect Dis. 2018 Nov 16;5(11):ofy297. doi: 10.1093/ofid/ofy297. eCollection 2018 Nov.

²Yu et al. Open Forum Infect Dis. 2020 Jan 4;7(1):ofz544. doi: 10.1093/ofid/ofz544. eCollection 2020 Jan.

³Nero et al. Am J Infect Control. 2023 Sep;51(9):1017-1022. doi: 10.1016/j.ajic.2023.01.011. Epub 2023 Feb 1.



Future Direction



Questions

