



New Frontiers of Infection Prevention: The Non-Antibiotic Antimicrobial Lock

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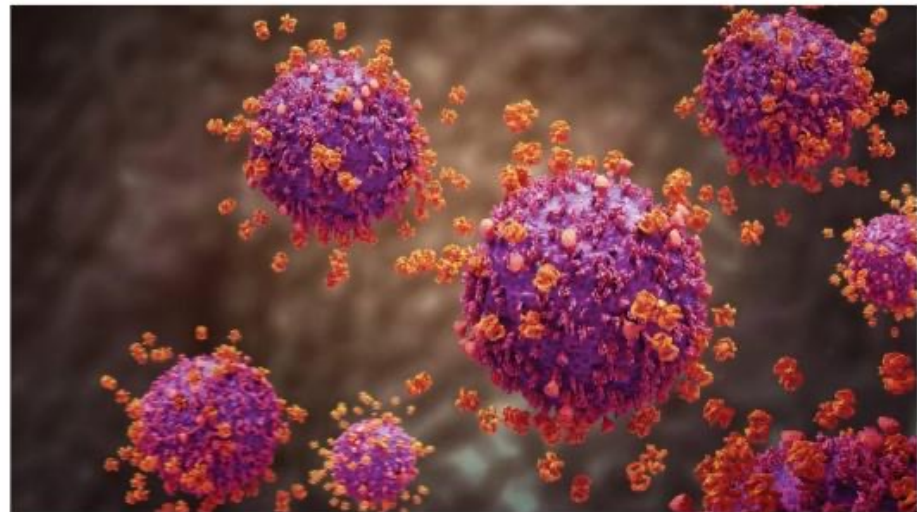
The Hospital for Sick Children,
University of Toronto
Toronto, Canada

LOCK SOLUTION

Finding a lock solution to reduce antibiotic use and save lives addressing the devastating consequences of antibiotic overuse in modern medicine

The threat of antimicrobial resistance

2nd November 2019



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Co-chair, John Ryan, addresses how the EU can become the best practice region in combating antimicrobial resistance.

WHY IS IT IMPORTANT?



PREVENTION OF CLABSI

01
Techniques



02
Procedures



03
Products



LOCKING SOLUTIONS IN HOME PN POPULATION AT SICKKIDS

- ❖ Standard of care - Heparin
- ❖ Ethanol lock at SickKids
 - Early Experience*
 - Systematic Review**

12.2



0.9

81%



72%



*Wales, et al, 2009

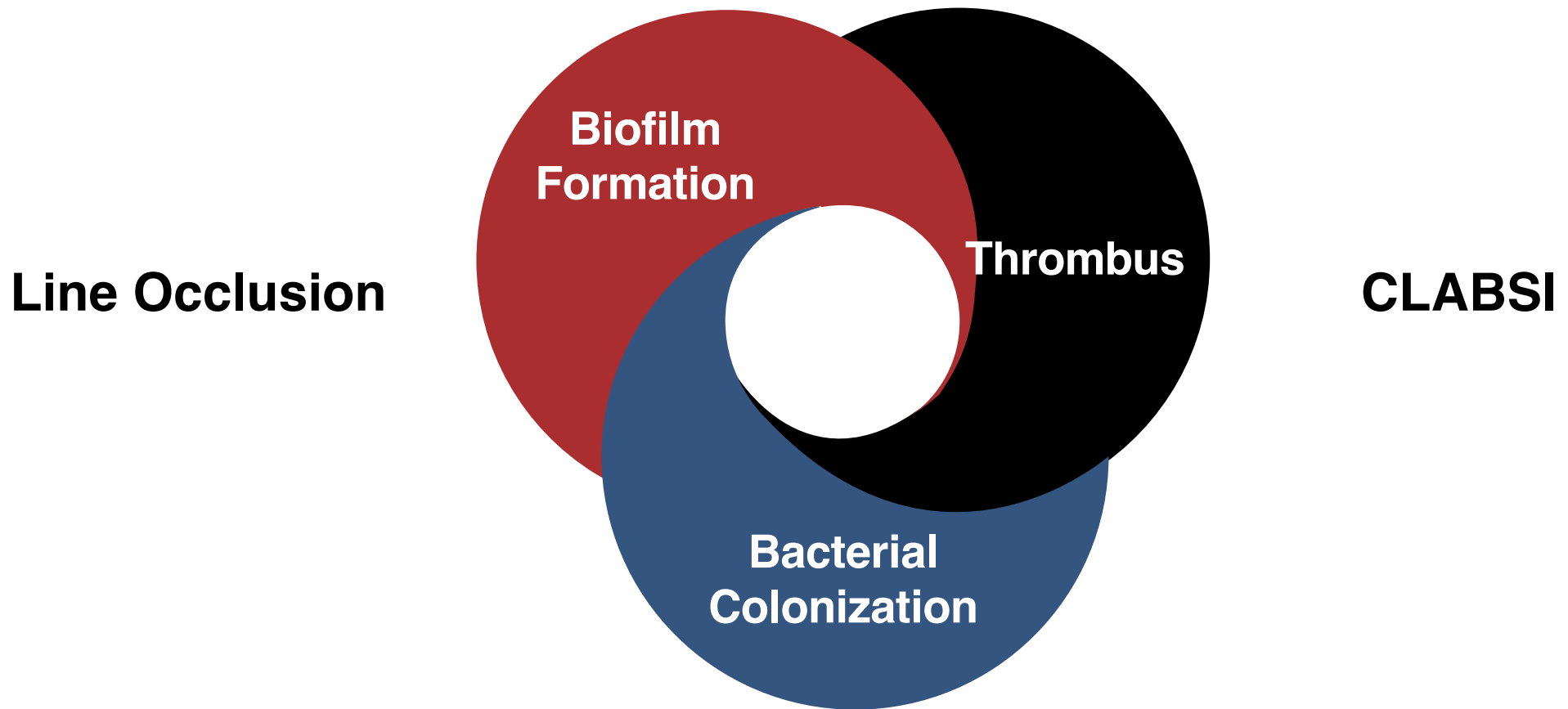
** Oliveira, et al, 2012

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CHALLENGES



WHAT ARE WE TRYING TO TREAT?



WHICH WAY WILL YOU CHOOSE?

KiteLock™ 4%
Sterile Catheter Lock Solution

Citrate

Taurolidine

Heparin / Alteplase

TETRASODIUM EDTA

- ✓ Anticoagulant
- ✓ Antimicrobial
- ✓ Prevent biofilm
- ✓ Eradicate biofilm
- ✓ Not an antibiotic



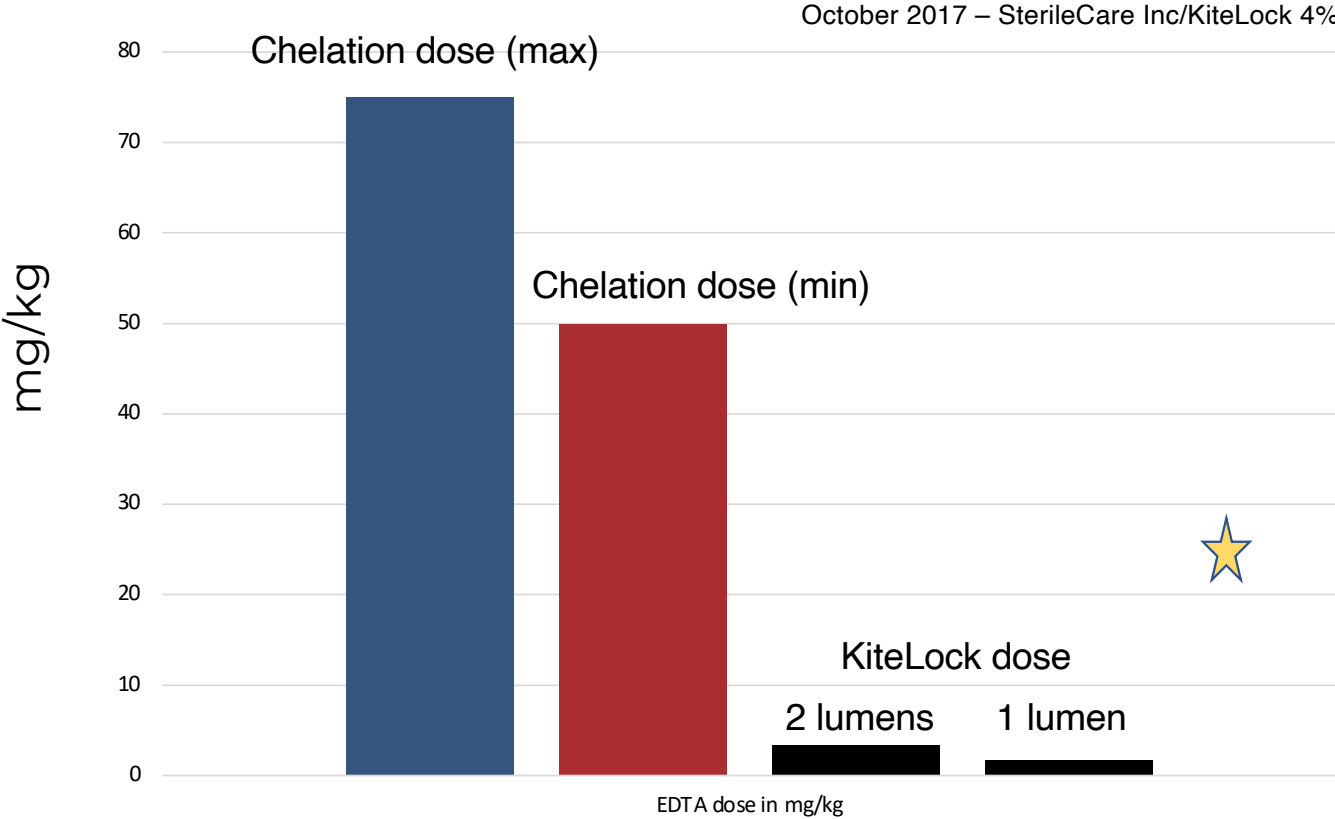
Proeschler 1951. Proceedings of the Society for Experimental Biology and Medicine. 76(4):

Kanaa et al, 2015. Am J Kidney Dis, 66(6):1015-1023.

Percival et al, 2005. Infect Control Hosp Epidemiol, 26(6):515-519.

Kite et al, 2004. Journal of Clinical Microbiology, 42(7):3073-3076.

SAFETY PROFILE OF KITELOCK 4% STERILE CATHETER LOCK SOLUTION



OUR EXPERIENCE

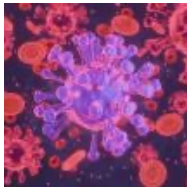
- ❖ Outpatient
- ❖ History of line infections or recurrent blockages
- ❖ Procedure for home:
 - Instill 1 ml at end of cycle time (port volume = 3ml)
 - Initial protocol – withdraw Kitelock prior to starting TPN
 - Current protocol – flush Kitelock prior to starting TPN



HOW WE EVALUATED KITELOCK IMPLEMENTATION



METHODS FOR EVALUATION



Infection Rate



Alteplase Use

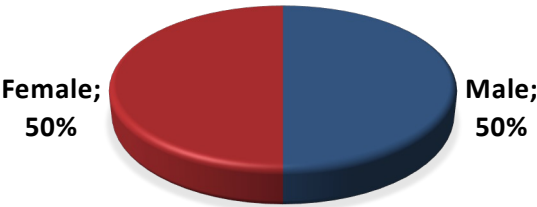


Line Exchange

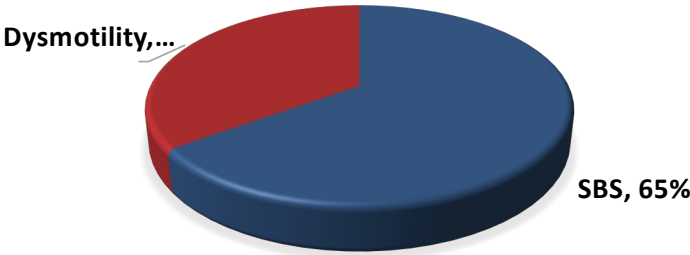
- ✓ Wilcoxon matched-pairs signed-rank test
- ✓ Medians (IQR) & frequencies (proportions)
- ✓ Alpha value <0.05

DEMOGRAPHICS

SEX

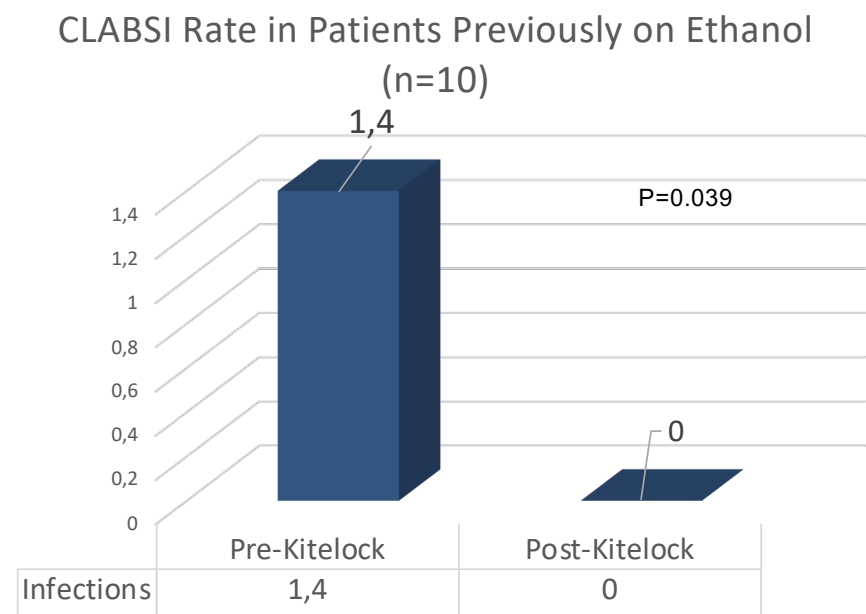
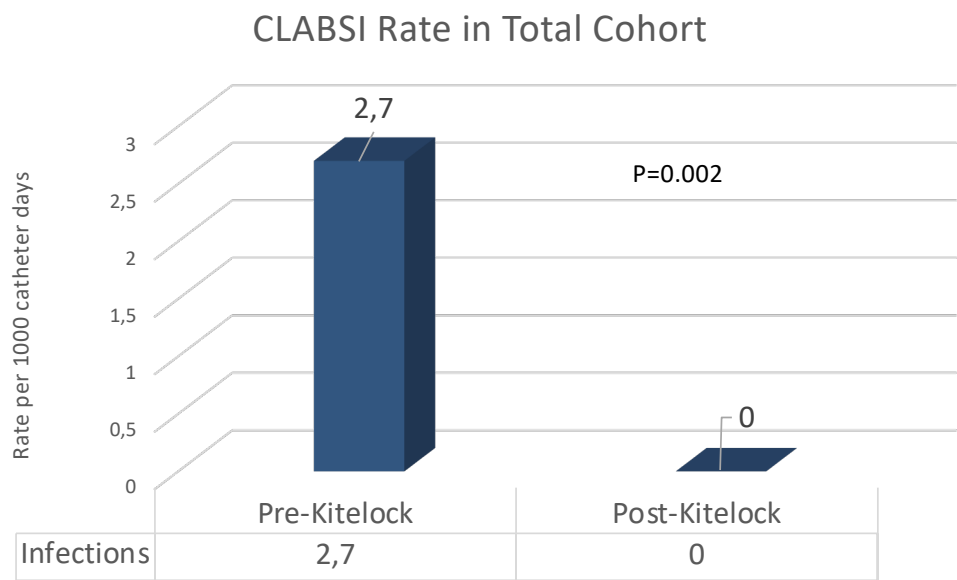


ETIOLOGY



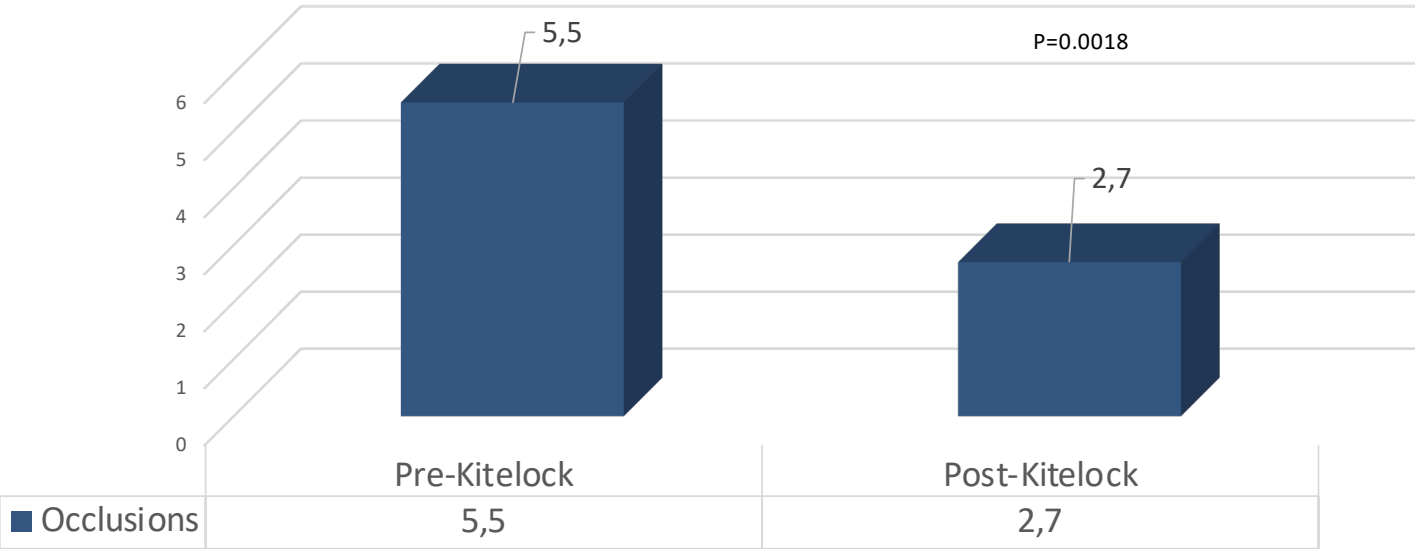
	Median (IQR) / Frequency (%)
PN days	2251 (941-2831)
SB percentage	18.5 (8.5-90.5)
LB percentage	62.5 (9.3-100.0)
Gtube	18 (90.0)
Stoma	6 (30.0)

RESULTS

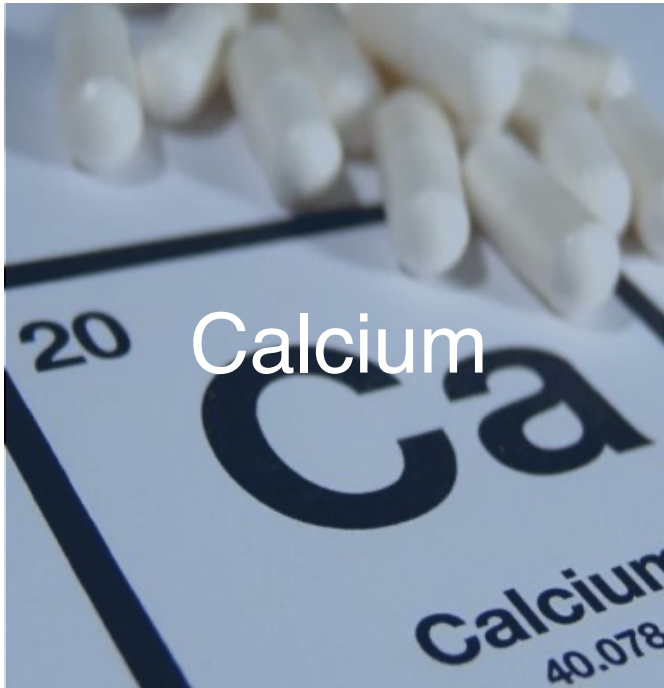


RESULTS

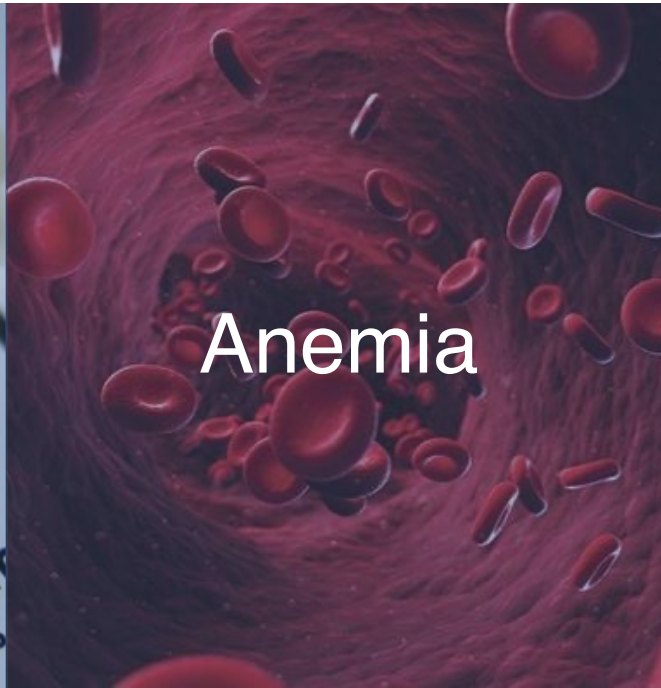
Occlusion Rate per 1000 catheter days in Children with history of alteplase use



ADDRESSING SAFETY



Calcium



Anemia



Effectiveness

ADDRESSING COST

Prevention of CLABSI with catheter lock solution



1 Heparin Lock

- ❖ Current standard of care
- ❖ Anticoagulant effect
- ❖ Risk of Heparin-Induced Thrombocytopenia
- ❖ Stimulates biofilm formation
- ❖ Lower cost



2 Taurolidine Lock

- ❖ Not Health Canada approved
- ❖ Antimicrobial
- ❖ No effect on existing biofilm
- ❖ Effective in reducing CLABSI
- ❖ Higher cost (20 times)



3 KiteLock 4%

- ❖ Approved by Health Canada
- ❖ Anticoagulant and Antimicrobial
- ❖ Prevent and eradicate biofilm
- ❖ Effective in reducing CLABSI and central line occlusions
- ❖ Higher cost (10 times)

COST UTILITY ANALYSIS

Primary:

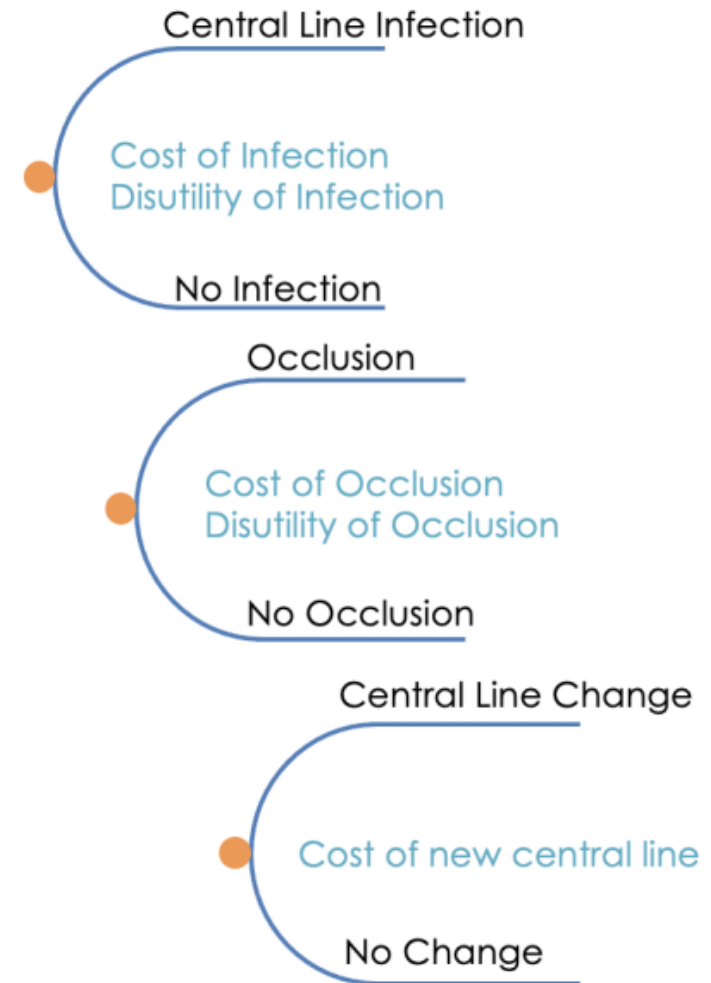
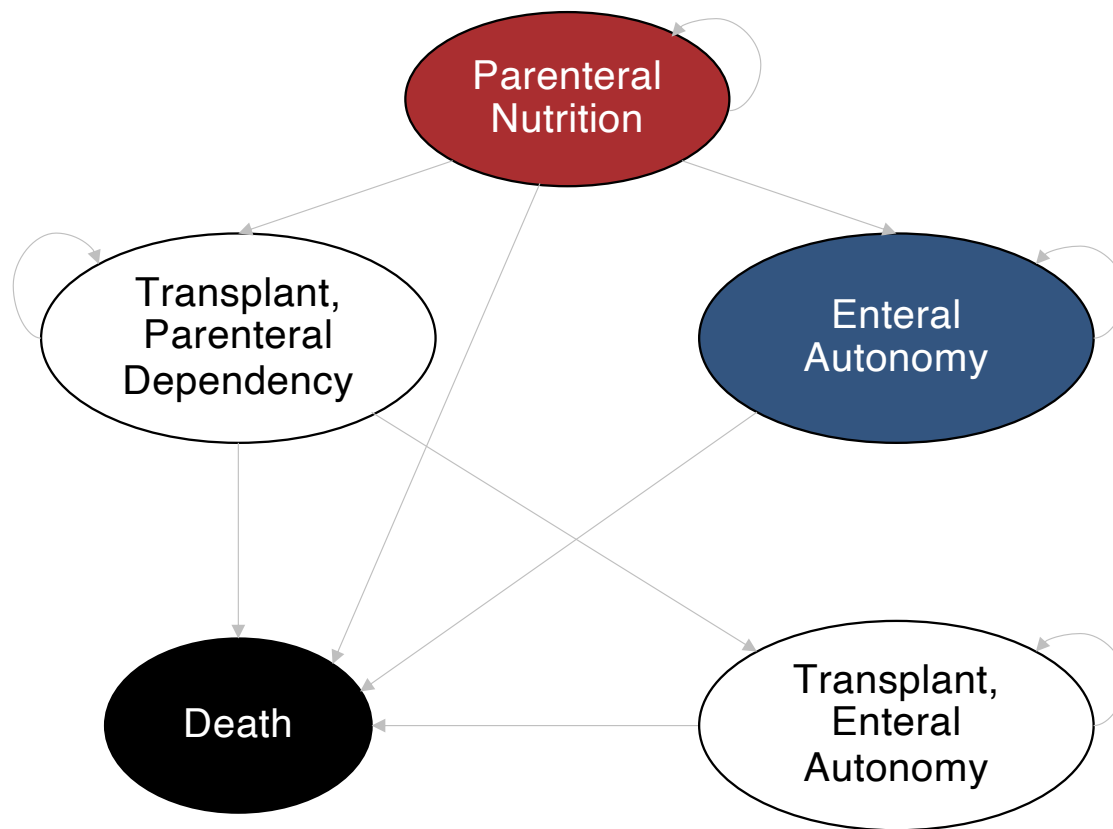
Determine the cost-utility of KiteLock and Taurolidine lock compared to heparin lock, in pediatric patients with intestinal failure and parenteral nutrition from the Ontario healthcare payer perspective.

Secondary:

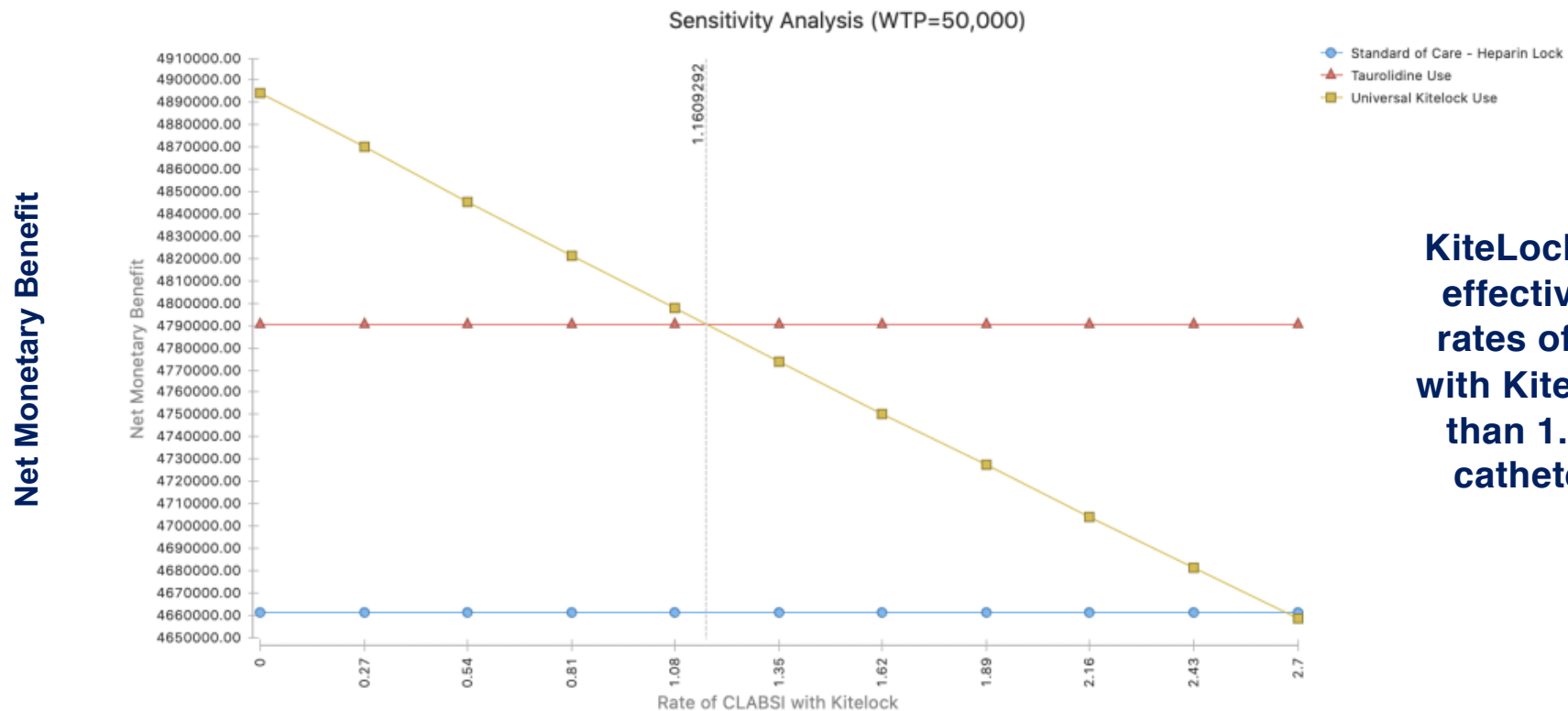
- ❖ Rate of CLASBSI
- ❖ Parenteral Nutrition Dependency
- ❖ Mortality



MODEL DESIGN



ONE-WAY SENSITIVITY ANALYSIS: RATE OF CLABSI WITH KITELOCK



KiteLock is cost-effective for all rates of CLABSI with KiteLock less than 1.16/1000 catheter days

Rate of CLABSI with KiteLock (per 1000 catheter days)

RESULTS: SCENARIO ANALYSIS

Scenario	Incremental Cost	Incremental QALYs	ICER (\$/QALY)
Time horizon, 5 years	-\$109,754	0.12	KiteLock dominates
Probability of CLABSI with KiteLock equals that of heparin	-\$61,467	0.12	Taurolidine dominates
Probability of occlusion with KiteLock equals that of heparin	-\$110,049	0.20	KiteLock dominates
Cost of KiteLock equals cost of heparin	-\$114,355	0.19	KiteLock dominates
KiteLock starts 5 years after IF diagnosis (stable EA probability)	-\$4,446	0.18	KiteLock dominates

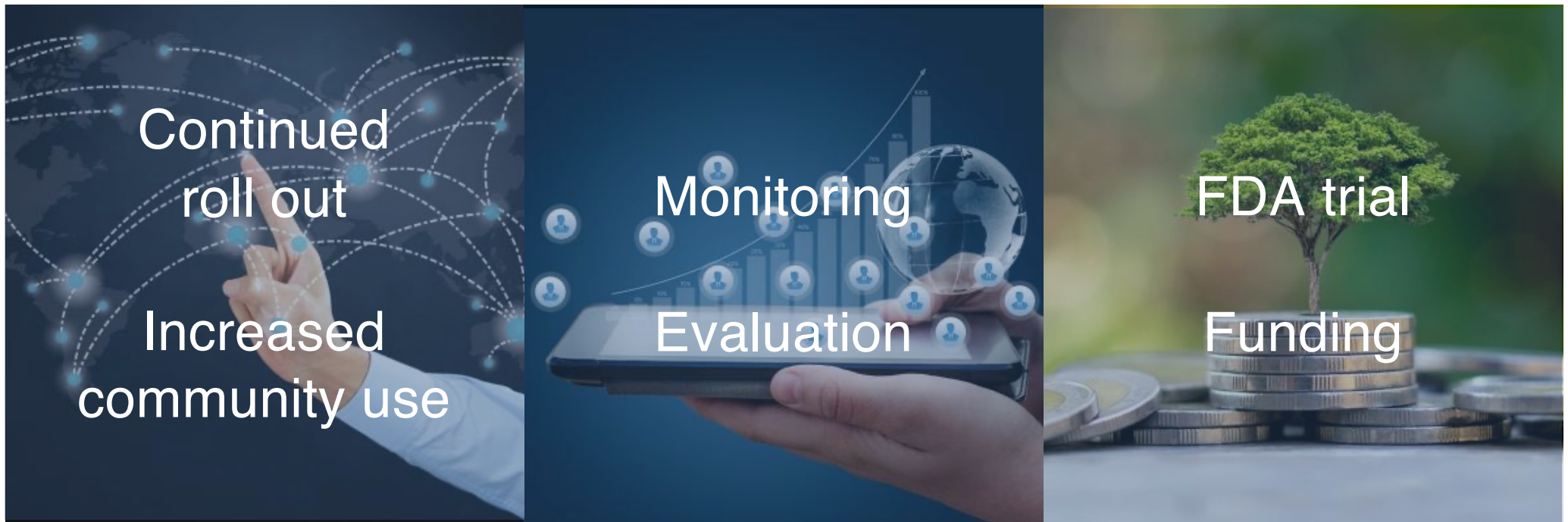
ECONOMICS

Table 3. Return-on-investment calculations for 20 HPN patients pre and post 4% T-EDTA implementation as the sole catheter lock solution (in Canadian dollars, CAD).

	Unit cost (CAD)	12 months				24 months			
		Standard of care lock solution		4% T-EDTA lock solution		Standard of care lock solution		4% T-EDTA lock solution	
		Number	Total cost	Number	Total cost	Number	Total cost	Number	Total cost
0.9% Sodium chloride	0.48	600	288.00			1200	576.00		
Heparin	0.52	3625	1885.00			7250	3770.00		
Taurolidine	10.78	3000	32,340.00			6000	64,680.00		
4% T-EDTA	5.50			7200	39,600.00			14400	79,200.00
Alteplase	68.00	11	748.00	0	–	22	1496.00	0	–
Catheter replacement	220.00	9	1980.00	6	1320.00	18	3960.00	12	2640.00
CLABSI	15,809.48	14	221,332.72	3	47,428.44	28	442,665.44	7	110,666.36
Total cost			258,573.72		88,348.44		517,147.44		192,506.36
Cost savings					170,225.28				324,641.08
Percentage cost reduction					66				63

HPN: home parenteral nutrition; T-EDTA: tetrasodium ethylenediaminetetraacetic acid; CLABSI: central line-associated bloodstream infection.

FUTURE DIRECTIONS



CONCLUSION

- ❖ Line complications have significant impact on the patient and health care system
- ❖ Majority of CLABSI and line complications are preventable
- ❖ Tetrasodium EDTA has shown early promise in intestinal failure population for prevention of CLABSI and line occlusions
- ❖ No safety concerns to date





Thank You!

Get in touch