

Team 1: Design of a Check Valve Foley Catheter System to Prevent CAUTIs

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Identified Need

Patients who use catheters for several days need a way to reduce the risk of urinary reflux in order to reduce instances of catheter associated urinary tract infections (CAUTIs).

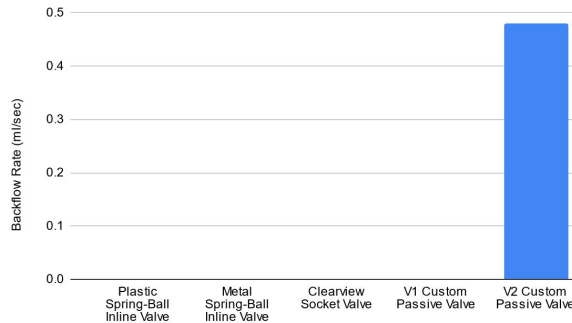
- Urinary backflow from extended periods of catheter use cause these infections
- Roughly 75% of UTIs acquired in hospitals are associated with a urinary catheter (CDC, 2015).

Design Criteria

Need	Measurable Criteria
Facilitate forward flow	%forward flow in relation to a normal catheter → forward flow is reduced at most by 15-20% in relation to normal catheter flow
Prevent Backflow	%backflow as a function of forward flow → max backwards flow is 5% of forward flow
Minimize cost	%cost increase in relation to a normal catheter → max increase is 15-20%
Ease of Use	Catheter insertion process should not change

Prototype Testing + Results

Backflow Behavior for Various Valve Types



Overall Findings

- Backflow testing met our criteria in most cases
- Our valves can be constructed for ~\$0.36-0.40
- Valves integrate directly into existing catheter systems
- Valve connectors and interior finish need to be refined
- Forward flow characteristics need to be tested/verified

Future Directions

- Remanufacture prototype with resin 3D printing
- Evaluate viability using live bacterial culture

Acknowledgements & References

Centers for Disease Control and Prevention. (2015, October 16). Catheter-associated urinary tract infections (CAUTI). Centers for Disease Control and Prevention. Retrieved October 5, 2021, from https://www.cdc.gov/hai/ca_uti/uti.html.
ASTM (2019, April 26). ASTM F623-19 Standard Performance Specification for Foley Catheter. ASTM. Retrieved October 5, 2021

Engineering Standards

ASTM - F263-19 Specification for Foley Catheter

ASTM F2475-20: Biocompatibility of Packaging Materials

ASTM D6954-18: Testing Plastics that Degrade in the Environment by a Combo of Oxidation and Biodegradation