

# Novel Anti-Infective Urinary Catheter and Drainage System using Soft Robotic Technology

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## Background & Unmet Need

- Urinary tract infections (UTIs) are the most common type of hospital acquired infections, with over 250,000 incidences per year
- The majority (75%) of hospital-acquired UTIs are linked to conventional indwelling urinary catheters
- The Centers for Disease Control and Prevention estimates that the cost of treating Catheter-associated UTIs (CA-UTIs) is \$350 million per year
- However, new catheter materials and alternative catheter designs have thus far failed to significantly reduce the incidence of CA-UTIs
- There are ~75 M indwelling Foley catheters utilized annually worldwide, with an estimated global Foley catheter market of ~\$1 B in 2018
- **Unmet Need:** There is a pressing need for innovations in catheter design that reduce the risk of CA-UTIs

## Technology Overview

- **The Technology:** A novel urinary catheter and drainage system designed to reduce the risk of developing CA-UTIs by using soft robotic actuation to actively open the drainage eyelet without changing the cost of catheter production
- The revised catheter has a drainage eyelet that resembles a slit, such that it is closed during introduction into the urethra, partially open once in the bladder, and fully open once inflated (as one would do for the retention balloon)
- This novel design reduces the likelihood of a biofilm being loaded into the eyelet during introduction as is the case with conventional catheters
- **PoC Data:** In a simulated experiment, the novel catheter significantly reduced contamination (**12x less**) compared to a standard catheter
- The novel catheter was also shown to not impair flow rate compared to a standard catheter, and retained its actuation ability after repeated usage

## Inventors:

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## Patents:

[PCT Application Filed](#)

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## Cornell Reference:

D-8534

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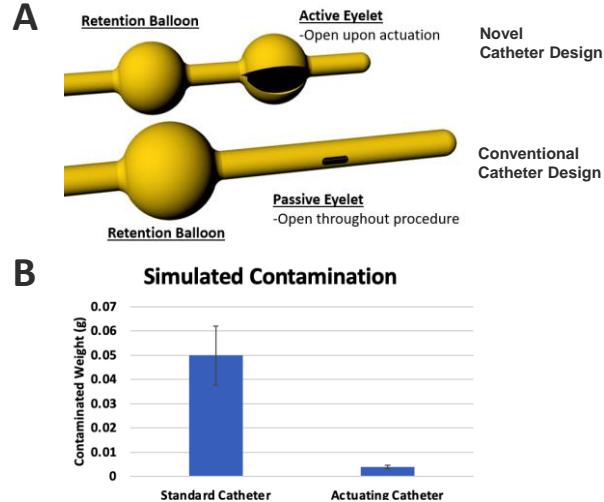
## Technology Applications

- Reduced incidence of CA-UTIs in patients that require an indwelling catheter
- Improved treatment and outcomes for patients suffering from urinary incontinence

## Technology Advantages

- Novel catheter design is amenable to production with existing machinery, thus no increased costs
- Soft robotic actuation requires simple inflation, requiring no additional training for nurses compared to use of conventional catheters

## Supporting Data / Figures



**Figure 1:** **A.** Improved catheter design includes an active drainage eyelet to reduce the risk of biofilm formation during catheter insertion. **B.** Actuating catheter significantly reduced contamination compared to a standard catheter in a simulated experiment (experimental overview in Figure 2).

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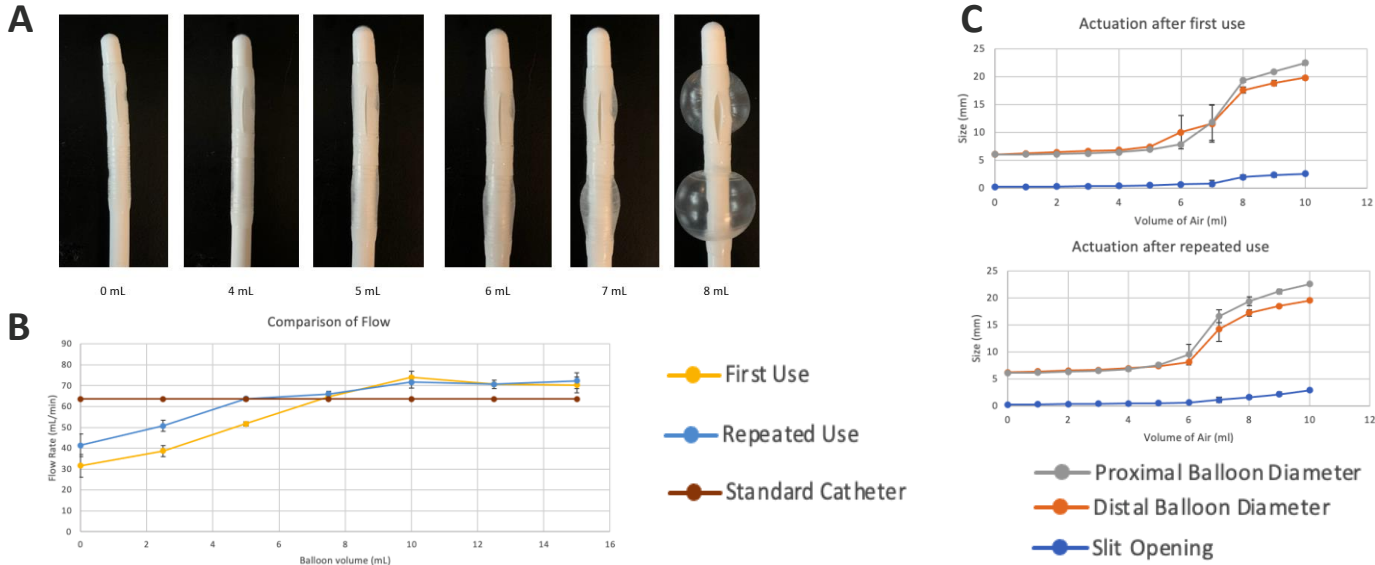
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## Supporting Data / Figures



**Figure 2: A.** The actuating eyelet (top) and retention balloon (bottom) at various inflation volumes. **B.** Actuating catheter provided a similar flow rate as a standard catheter even after repeated use. Note that at zero inflation volume, flow still occurs to avoid safety issues. **C.** The actuating catheter shows reproducible inflation diameters after repeated usage.

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