



A Retrospective Comparison of Two Closed Urinary Collection Systems and the Incidence of Nosocomial Infections in a Veterinary Referral Hospital

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Introduction

Antimicrobial resistance (AMR), is one of the biggest threats in modern medicine (Catalano *et al.* 2022). Therefore, preventing catheter associated urinary tract infections (CAUTIs), will help reduce antibiotic usage.

Rationale: It was observed whilst working in a veterinary referral centre that two different urinary drainage systems were used in different wards in the same hospital. Each were considered 'best practice' by the nurses' for the respective wards.

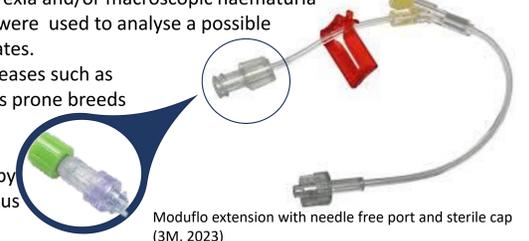
Therefore, this study investigates whether there was a difference in incidence of UTI between the needle-free 'Moduflo' intermittent drainage urinary collection system and the traditional closed bag system.

- The neuro-cohort Moduflo™ system was attached directly to the urinary catheter with a port with a needlefree valve covered with an alcohol cap.
- The ICU-cohort used a prepackaged closed drainage bag system (CDS).
- Differing professional opinion was formed from anecdotal evidence of urethral trauma through the CDS in deep pain negative neurology patients, as well as some recent research that intermittent drainage allowed for a quicker recovery of bladder function post neurosurgery (Balhi *et al.* 2021; Cao *et al.* 2023). ICU nurses argued a lack of time for manual drainage and that ICU patients were often collapsed and did not anecdotally suffer drag injuries.

Methods

Long-term urinary catheter usage (>3 days) allows for biofilm formation which creates a ladder for bacteria to climb into the urethra and bladder. Intraluminal or extraluminal contamination through structural design or poor hygiene protocols increases risk of CAUTI development (Newman, 2021).

- A retrospective cohort comparative study using data from between 2022 to 2024.
- The population consisted of two cohorts: dogs in the neurology ward that all had Moduflo (Neuro-cohort); dogs in the ICU that all had CDS (ICU-cohort).
- Both cohorts had foley urinary catheters in-situ for at least three days. The independent variable was type of drainage system, and the dependant variable was the incidence of proven UTI.
- Data was obtained retrospectively from hospital kennel sheets, patient history and clinicians' notes and stored in Excel and processed in Genstat 24th edition.
- Incidence of proven UTI was defined by a positive microbiology culture. Additional data collected pertaining to the period when the catheter was in-situ were: presence or absence of pyrexia and/or macroscopic haematuria and urinalysis suggestive of possible UTI. Chi squared statistics were used to analyse a possible association between factors and Mann-Witney U between variates.
- Dogs were excluded if they had the following: autoimmune diseases such as diabetes, Cushing's and Addison's. Skin conditions, or dermatitis prone breeds e.g., Shar Pei, French Bulldog, Pug (Torres *et al.* 2005; Dupont *et al.* 2020). If there was difficulty placing the urinary catheter resulting in possible trauma, prostate masses, cystitis, cystoscopy last two weeks (Albers *et al.* 1996; Storme *et al.* 2019). A previous UTI diagnosis (Llido *et al.* 2020).



Results

Cohort demographics

- Eighty-four dogs were included in the study, 19 in ICU-cohort and 65 in neuro-cohort.
- 36 breeds were represented in the study with Labrador (2), Dachshund (2), Cocker spaniel (2) and Greyhound (2) being the most represented in ICU-cohort and Dachshund (18), Labrador (8), Cockerpoop (6) in neuro-cohort.
- Spinal paralysis (IVDD) was the most represented reason for hospitalisation in the study (60) with 96.7% (58/60) of the cases from neuro-cohort. In ICU-cohort, Leptospirosis (3) was the most represented reason for hospitalisation. 89% (17/19) ICU-cohort were male, and 81.5% (53/65) of neuro-cohort were male.

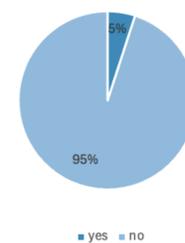
Cohort demographics such as age and IDUC time were not statistically significant between the cohorts.

Furthermore, confounding variable evaluation between antibiotic use and UTI rate, age and UTI rate, and IDUC time and UTI rate were not found to be statistically significant between the two cohorts.

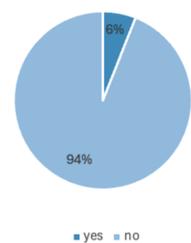
- Mean IDUC time was 3.75 days.
- The mean age of patients was 6.94 years old.
- ICU-cohort, 74% (14/19) of patients were on antibiotics, whereas in neuro-cohort, 57% (37/65) of patients were on antibiotics. Chi squared analysis showed no statistical difference ($p=0.912$) between antibiotics usage between the cohorts.

The incidence of UTI was 1/19 (5%) in the ICU-cohort and 4/65 (6%) in the neuro-cohort. Difference in UTI incidence was not significant ($p=0.885$) between the two cohorts. However, haematuria was significantly ($p=0.048$) higher in the neuro-cohort 34% (22/65), compared to ICU-cohort 11% (2/19). Pyrexia was also significantly higher ($p=0.013$) in the ICU-cohort 53% (9/19) compared to neuro-cohort 24% (15/65).

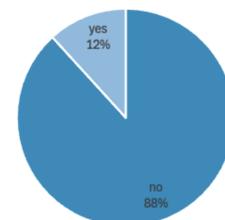
Percentage of patients with UTI diagnosis in ICU



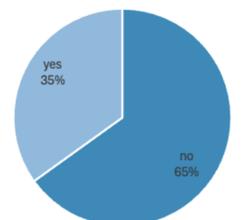
Percentage of patients with UTI diagnosis in Neuro



Haematuria in ICU Patients



Haematuria in Neurology Patients



Discussion/Conclusion

This study did not show a significant difference in the incidence of proven UTI between the two cohorts. This could be because there was no difference, or the sample size was too small to demonstrate a difference given the low incidence of proven UTIs in each cohort.

- Low incidence of UTI could be due to masking of clinical signs through antibiotics, as in ICU-cohort, 74% (14/19) of patients were on antibiotics, whereas in neuro-cohort, 57% (37/65) of patients were on antibiotics.
- The higher incidence of pyrexia in the ICU-cohort suggests that high temperature is more likely to reflect non-specific inflammation in this sicker cohort.
- The high rate of haematuria in neuro-cohort is unexplained.
- A cost benefit to either of the systems was not explored, but it was noted that time to complete manual drainage in the Moduflo systems was greater.
- The low power (2.9%) for UTI diagnosis is likely due to the low incidence of infection in both cohorts (11% overall).
- There were no significant differences in age, catheter in-situ time and antibiotic usage ($p<0.05$) between both cohorts. Which suggests that these are unlikely to be confounding factors between the two cohorts.
- The high representation of male patients (83%, 70/84) could also be a reason for a low UTI rate (Hall *et al.* 2013).
- A higher power of 51% was seen in haematuria rate, with the neuro-cohort having a higher number of cases. This shows that the rate of haematuria was higher and there was likely enough power to make this a correlation not a coincidence. However, whether this was due to the type of urinary drainage system or a risk of surgically treated disc extrusions (Olby *et al.* 2010), as 89% (58/65) patients in neuro-cohort had some form of IVDD.

This study suggests that there is little UTI risk in using ModuFlo extensions and needle free ports for manual urinary drainage and that current standard operating procedures (SOPs) in place for maintenance and asepsis were adequate for both systems.

- Future research could investigate whether high incidence of haematuria is reproduced in a larger study of neurology patients. If this is a true finding, then possible preventable causes should be explored.
- One hypothesis- generating idea is whether haematuria is caused by urinary catheter drag in dogs with paraplegia, as despite the Moduflo being attached to the body with Surgifix, neuro-cohort was mostly IVDD, 96.7% (58/60) and would drag hindlimbs leading to possible catheter friction along bedding.

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