Original Article

Cost benefit micro-analysis of performing urine cultures as a mean to reduce post-flexible cystoscopy urosepsis: a comparative study between two centres

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Contributions: (I) Conception and design: All authors; (II) Administrative support: All authors; (III) Provision of study materials or patients: All authors; (IV) Collection and assembly of data: A Rahman, M Qiu, K Ravichandran; (V) Data analysis and interpretation: A Rahman, M Qiu; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

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Background: In Australia, flexible cystoscopy is a key diagnostic tool in urology, employed to manage various conditions. However, it carries risks like urinary tract infections and urosepsis, which lead to significant healthcare expenses. This study evaluates the cost-effectiveness of pre-procedure urine cultures to prevent post-cystoscopy urosepsis.

Methods: A retrospective analysis of data from regional Toowoomba Base Hospital and metropolitan Gold Coast University Hospital was conducted to assess the efficacy of urine cultures in reducing urosepsis following flexible cystoscopy. The study reviewed patient records, analysing both the incidence of post-procedure urosepsis and the associated economic impact.

Results: The incidence of post-procedure urosepsis was found to be exceptionally low at 0.03%. Comparative analysis showed no significant reduction in urosepsis rates with the use of pre-procedure urine cultures (P=0.93). The financial analysis highlighted that the regional centre, which conducted urine cultures, incurred costs $ 26.14 per patient greater compared to the metropolitan centre that did not perform these cultures.

Conclusions: The study indicates that the low incidence of urosepsis does not justify the routine use of pre-operative urine cultures, given the substantial costs involved. These findings support current guidelines that do not recommend routine pre-procedure cultures for cystoscopy due to lack of evidence of benefit.

Keywords: Flexible cystoscopy; urine culture; antimicrobial stewardship; health economics; post-instrumentation urosepsis

Submitted Aug 12, 2024. Accepted for publication Feb 13, 2025. Published online Mar 26, 2025.
doi: 10.21037/tau-24-417
View this article at: https://dx.doi.org/10.21037/tau-24-417

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Introduction

Flexible cystoscopy, commercially introduced in 1984 by Olympus and studied by Clayman, Reddy and Lange in the same year (1), has emerged as a pivotal diagnostic tool in urology, offering a low-risk endoscopic approach for investigating various urological conditions (2). These conditions encompass urethral stricture disease, prostatomegaly, bladder cancers, and the evaluation of haematuria (3). Given its diagnostic significance and safety profile, flexible cystoscopy likely see widespread usage across Australia's healthcare landscape.

While the precise annual count of flexible cystoscopies in Australia remains undocumented, it is evident that this procedure holds indispensable value for urological diagnosis, surveillance, and treatment. Notably, the United States has reported over a million flexible cystoscopy procedures conducted between 2009 and 2015, underscoring the global prevalence of this technique (4). However, despite its low risk, flexible cystoscopy is not devoid of post-procedural risks, particularly the development of symptomatic urinary tract infections (UTIs) or the more severe complication of urosepsis, imposing substantial healthcare costs (5-8).

Guideline recommendations regarding the administration of prophylactic antibiotics and pre-procedural urine culture for flexible cystoscopy vary across regions. The American Urological Association (AUA) Guidelines omit suggestions for pre-procedural urine cultures and targeted antibiotic prophylaxis (9), while the European Urological Association (EAU) Guidelines, adopted in Australia, discourage antibiotic prophylaxis for patients undergoing cystoscopy, irrespective of the method used (10,11).

Unfortunately, despite these robust guidelines, a lack of standardized practice persists among Australian healthcare facilities. This disparity is especially concerning given the potential to mitigate post-instrumentation urosepsis admissions through pre-flexible cystoscopy urine cultures. Considering the significant healthcare burden associated with urosepsis, there is a clear imperative to evaluate the cost-benefit implications of such a preventative strategy.

This study endeavours to conduct a comprehensive cost-benefit analysis of pre-flexible cystoscopy urine cultures, aiming to reduce the incidence of post-instrumentation urosepsis admissions. By scrutinizing the economic ramifications, patient outcomes, and healthcare system effects, this research seeks to contribute valuable insights to clinical decision-making and promote standardized practices within the Australian healthcare context. We present this article in accordance with the STROBE reporting checklist (available at https://tau.amegroups.com/article/view/10.21037/tau-24-417/rc).

Highlight box

Key findings

- Performing urine cultures prior to outpatient flexible cystoscopy did not prevent post-instrumentation urosepsis.
- Cost-benefit analysis concluded economic inefficiency on a cost per patient basis.
- Causative organisms for post-instrumentation urosepsis were disconcordant with pre-operative organisms identified on culture.

What is known and what is new?

- Urological guidelines recommend against antibiotic prophylaxis in patients with asymptomatic bacteria.
- Performing urine cultures prior to outpatient flexible cystoscopy appears to have an economic disadvantage without any evidence of improving patient outcomes.

What is the implication, and what should change now?

- Urologists and health care providers should reconsider the use of targeted antibiotic prophylaxis to improve cost efficiency and resource distribution.

Methods

Study design

This study utilized a retrospective approach to analyse the effectiveness of implementing pre-outpatient flexible cystoscopy urine cultures in reducing the incidence of post-instrumentation urosepsis admissions.

Data collection and sources

Data were collected from two major healthcare institutions, Toowoomba Base Hospital (TBH), a regional centre, and Gold Coast University Hospital (GCUH), a metropolitan centre over a 12-month period in the outpatient setting. Patient records were reviewed to identify cases of post-instrumentation urosepsis. Cases of urosepsis were identified by presentations to the hospital of their own accord, neither centre implemented an immediate post-procedure follow-up to determine any cases of non-urgent UTIs due to departmental service limitations. This study defined post-instrumentation urosepsis as an episode occurring within 2 weeks of the flexible cystoscopy procedure, this timeframe

was comparable to that of existing literature (6,12,13). In both centres, the diagnosis of urosepsis was established based on the electronic therapeutic guidelines (eTG) criteria, requiring the presence of any two of the following: Glasgow Coma Score <14, respiratory rate ≥22 or hypoxemia, hypotension (systolic blood pressure <90 mmHg), lactate ≥2, fever (≥38 ℃), and a urinary source (14).

Exclusion criteria for this study included:

(I) Cases requiring emergent management, such as flexible cystoscopy for urgent clinical indications [e.g., indwelling catheter (IDC) insertion under direct vision], as these represent non-elective procedures with distinct clinical contexts.
(II) Patients with pre-existing indwelling urethral catheters, due to their higher baseline risk of urinary tract complications.
(III) Patients presenting with symptomatic UTI at the time of the procedure.

The exclusion criteria were implemented due to the dynamic nature of the above procedures, the aim of this study was to observe post-instrumentation urosepsis in a controlled setting.

In TBH pre-operative urine cultures were taken and positive cultures were treated with targeted antibiotics prior to flexible cystoscopy while at GCUH there was no implementation of urine cultures.

Causative organism assessment

For cases of urosepsis readmission, microbial cultures were scrutinized to determine whether the causative organism was identified on the pre-procedure urine culture.

Cost assessment

The economic evaluation involved the assessment of costs associated with hospital admissions due to post-instrumentation urosepsis. The costs of hospital admissions were determined using National Reports published by the Australian Institute of Health and Welfare. Additionally, costs associated with pre-procedure urine culture were calculated using the Medicare Benefits Schedule (MBS). The cost of performing a flexible cystoscopy was calculated using the MBS, costs of sterilising equipment were not included due to differing methods of sterilisation and economies of scale. Targeted antibiotic costs were calculated using the costs identified on the Pharmaceutical Benefits Scheme.

Statistical analysis

Descriptive statistics, including means, medians, standard deviations, and proportions, were employed to characterize the study population. The primary outcome measure was the reduction in post-instrumentation urosepsis admissions with the implementation of pre-flexible cystoscopy urine cultures. Comparative analyses were conducted using appropriate statistical tests. Statistical significance was set at $P<0.05$.

Ethical statement

The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was submitted and approved as a joint application by the regional Human Research Ethics Committee (No. LNR/2024/QTDD/101649). A waiver of consent was granted by the regional Human Research Ethics Committee due to the study's low or negligible risk.

Results

A total of 1,659 patients were included in the study over the 12-month period, comprising 637 patients who underwent pre-flexible cystoscopy urine cultures at the regional centre and 1,022 patients who did not undergo such cultures at the metropolitan centre (*Figure 1*). Among the 637 patients at the regional health service, ages ranged from 20 to 105 years, with a mean age of 68.9 years. At the metropolitan centre, the age range was 21 to 100 years, with a mean age of 70.98 years. The flexible cystoscopies were performed for a variety of indications, including diagnostic evaluations, stent removals, elective urethral dilations, and urodynamic assessments, reflecting the most common reasons for this procedure in clinical practice.

Among these patients, a remarkably low incidence of post-instrumentation urosepsis readmissions was observed, with a total of 2 readmissions reported from the regional centre and 3 from the metropolitan centre, resulting in an overall incidence rate of 0.03% (*Figure 2*). At the end of their admission were discharged to their usual place of residence and no deaths were recorded.

The Chi-squared analysis yielded a P value of 0.93, signifying a lack of statistical significance. This suggests that there was no significant difference in the rates of urosepsis readmissions post-flexible cystoscopy between the two groups, irrespective of whether pre-flexible cystoscopy urine

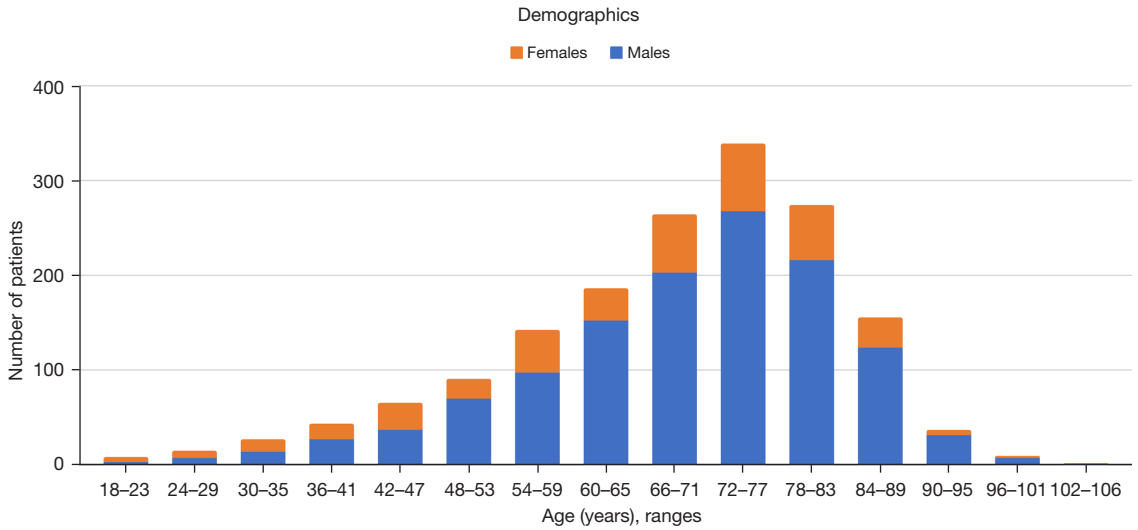

Figure 1 Distribution curve of population age in our cohort. It demonstrates a normal bell curve distribution with the peak age group of people undergoing flexible cystoscopies to be between 72–77 years.

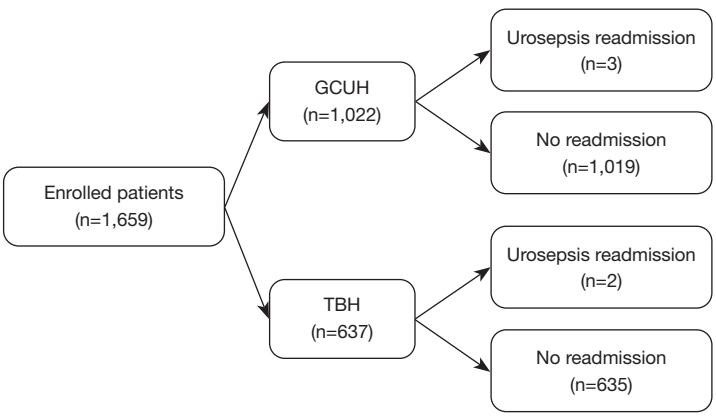

Figure 2 Urosepsis readmission rates split by health service. Readmission rates are extraordinarily low in both centres with an overall readmission rate being 0.03%, an insignificant difference between the two. This demonstrates the already known. GCUH, Gold Coast University Hospital; TBH, Toowoomba Base Hospital.

cultures were performed.

Of the two urosepsis readmissions reported at the regional centre, it was noted that the causative organism identified in the urine culture prior to instrumentation was discordant with the organism responsible for urosepsis. Preoperative urine culture reflected no growth in either patient, with one suffering from *Escherichia Coli* urosepsis and the other suffering from *Klebsiella Pneumoniae* urosepsis post-operatively. At the metropolitan centre, causative organisms were *Proteus Mirabilis*, *Pseudomonas Aerogenosa* and *Klebsiella Oxytoca*.

The cost analysis revealed that the expense associated with performing pre-flexible cystoscopy urine cultures over the course of 637 procedures conducted in 2022 amounted to $13,090.35 ($20.55 per urine culture as per Medicare Benefits Scheme).

Of 637 patients that underwent flexible cystoscopy at the regional hospital, per local guidelines 100 required antibiotic treatment. The total cost to patients over the 12-month period was an additional $2,421.23 with an average cost of $24.2123 per patient.

Costs for performing flexible cystoscopies in the regional

centre accumulated to $120,450.33 for 637 patients. For 1,022 patients in the metropolitan centre the total cost came to $194,077.80.

Comparing the costs of hospital admissions for uncomplicated urosepsis, it was found that the average cost of a 3-day admission in a regional hospital was $4,872.73. With two urosepsis readmissions, the total cost incurred for the regional centre was $9,745.46. In contrast, the average cost of a 3-day admission in a metropolitan hospital was $4,359.81, and with three urosepsis readmissions, the total cost for the metropolitan centre was $13,079.43.

In summation, the total cost to the regional centre for urosepsis-related admissions was calculated to be $22,835.78, whereas the total cost for the metropolitan centre amounted to $13,079.43.

The total cost to the regional centre in performing flexible cystoscopies and the outcome of post-instrumentation urosepsis summated to $145,707.37. In the metropolitan centre the cost to the health service was $207,157.23. With the difference in scale between the two centres the cost per patient in the regional centre was approximately $228.80 whereas, in the metropolitan centre this was $202.66.

Discussion

Post-operative urosepsis is a severe complication that can follow urological interventions, with significant morbidity and mortality implications. Mortality itself can range from 7.6% to 17.2% in those with up to three comorbidities, and 25% to 51.1% in those with three to six or more comorbidities according to a systematic review by Peach *et al.* (15). This systemic inflammatory response, which stems primarily from the urinary tract, heightens the importance of prophylactic measures. Current debates revolve around the clinical efficacy and economic impact of pre-operative urine cultures, a preventative strategy whose depths of clinical utility are yet to be fully ascertained. The rationale behind pre-operative urine culture is that detecting and treating subclinical bacteriuria before instrumentation could potentially diminish the risk of postoperative infections. However, this practice has been met with scepticism, as guidelines from both the EAU and AUA advise against routine urine cultures before straightforward cystoscopy due to the lack of evidence supporting their benefit (9,11).

Though there are no existing studies analysing the most common organisms causing urosepsis in Australia, studies by Kalra *et al.* and Wagenlehner *et al.* noted *Escherichia coli* as the most common organism, causing ~50% of cases of urosepsis, with both *Klebsiella* species and *Proteus* species at ~15% and *Pseudomonas aerogenosa* at ~5% (16,17). Interestingly, these rates were not reflected in our study, with two out of five patients suffering from *Klebsiella* species urosepsis, and only one suffering from the most common cause *Escherichia coli*. Hospital-acquired urosepsis may then be called into question, however, a study by Johansen *et al.* noted that the prevalence of causative micro-organisms and their prevalence as it pertains to our study were as follows; *Escherichia coli* at 31%, *Pseudomonas* species at 13%, *Klebsiella* at 10% and *Proteus* at 6% (18). This further appears discordant to the prevalence of species experienced between our two centres.

A systematic review and meta-analysis by Carey *et al.* reflected a statistically significant advantage in using prophylactic antibiotics for flexible cystoscopy for both lowering hospital admission rates and bacteriuria. However, the number needed to treat (NNT) for infection prevention was high; 32 for symptomatic UTI and 26 for asymptomatic bacteriuria. Prevention of hospital admission was higher still, with an NNT of 687 to prevent hospital admission. Rates of infections themselves were low at 0.12% across the study population (19).

In an economic context, the high costs associated with managing a single episode of post-operative urosepsis, which may necessitate intensive care, advanced antimicrobials, and prolonged hospitalization, seem to justify the pre-emptive expenses of urine cultures. For instance, Lagu *et al.* [2012] cited annual costs exceeding $24 billion for sepsis management in the United States alone (20). In the Australian context, the cost of sepsis in and of itself as reported by the George Institute for Global Health in Australia is estimated to be a total cost of $695 million, with urosepsis contributing to a proportion of these findings (21). Importantly, the infection rate itself from the Carey *et al.* study (19) further casts doubt on the utility of pre-operative urine culture in offsetting urosepsis treatment costs. Our study further contributes to this discourse by providing an analysis of the health economics associated with preventative measures for simple flexible cystoscopy.

Our study revealed an extremely low incidence of post-instrumentation urosepsis, standing at 0.03%. This finding challenges the hypothesis that pre-operative urine culture and targeted antibiotic therapy can substantially reduce the occurrence of urosepsis (P=0.93). Our results align with

other studies, such as Trail *et al.* [2021] and Herr [2015]. Trail *et al.* [2021] demonstrated similarly low culture-proven infection rates at 2.6% whereas urinary sepsis was even lower than that observed in our studies where no patients developed post-operative sepsis. Herr [2015] effectively showed that despite 22% of their patients' cohort having bacteria only 1.9% of cases developed a UTI in the post-operative setting (6,7). Interestingly, Cusumano *et al.*'s [2020] study demonstrated that even with pre-procedural urine culture and antibiotic prophylaxis, rates of UTI were similar post-procedurally (12). These findings collectively call into question the necessity of routine pre-operative urine cultures, especially in the context of procedures with a low risk of infection.

Further economic analysis illustrated a complex picture. The direct costs of admission were higher in the metropolitan centre; however, adding the expenses of conducting pre-operative urine cultures significantly increased the total costs for the regional health service. Specifically, it was found to be $26.14 more expensive per patient when accounting for the cost of urine cultures, antibiotic treatment and cost per procedure. Considering these costs with the results from Carey *et al.*, it further underscores the substantial economic burden of implementing urine cultures and treatment of bacteriuria prior to low-risk, high volume urological procedures such as flexible cystoscopy.

Literature on the economic impact of urine cultures in preventing urosepsis is sparse. Onderdonk *et al.* [1996] demonstrated that over a 1-year period, 14.64% of urine cultures performed were inappropriate according to literature-based exclusion criteria. Although this does not specifically relate to urological procedures it shows that estimated costs were significant at $2,340 per month to their respective health service (22).

Strengths and limitations

The strengths of our study include being the first to directly compare the costs between healthcare facilities that adhere to differing protocols regarding the prevention of urosepsis in simple endoscopic urological procedures. While our analysis may not encompass all potential costs, it provides an economic rationale for following EAU and AUA guidelines.

Nevertheless, several limitations must be acknowledged. First, our study did not account for the costs associated with post-instrumentation symptomatic UTIs, limiting the scope of our economic evaluation. Second, the study did not consider variances in how flexible cystoscopies are performed, which could affect cost outcomes. The inclusion of operating theatre utilization costs could yield a more comprehensive economic analysis. Lastly, the comparison was limited to two hospitals in Australia, which constrains the generalizability of our findings.

Future research should aim to include a broader range of healthcare settings to enhance the robustness and applicability of the results. It should also incorporate a more extensive evaluation of healthcare costs, including those associated with symptomatic UTIs and varied procedural protocols such as those excluded in this criterion per the exclusion criteria. Expanding the scope of economic analyses to include a wider array of cost factors will be crucial for a more accurate assessment of the value of pre-operative urine cultures in preventing urosepsis after urological procedures.

Conclusions

In conclusion, our study sheds light on the potential economic and clinical implications of performing pre-operative urine cultures prior to flexible cystoscopy procedures. While the rarity of urosepsis occurrences post-instrumentation is evident, the associated costs and lack of substantial impact on urosepsis reduction challenge the rationale for the implementation of this practice. The findings underscore the importance of evidence-based decision-making in healthcare policies and practices. Further research within a larger and more diverse cohort can provide a more comprehensive understanding of the topic.

Acknowledgments

None.

Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at https://tau.amegroups.com/article/view/10.21037/tau-24-417/rc

Data Sharing Statement: Available at https://tau.amegroups.com/article/view/10.21037/tau-24-417/dss

Peer Review File: Available at https://tau.amegroups.com/article/view/10.21037/tau-24-417/prf

Funding: None.

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://tau.amegroups.com/article/view/10.21037/tau-24-417/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was submitted and approved as a joint application by the regional Human Research Ethics Committee (No. LNR/2024/QTDD/101649). A waiver of consent was granted by the regional Human Research Ethics Committee due to the study's low or negligible risk.

References

1. Clayman RV, Reddy P, Lange PH. Flexible fiberoptic and rigid-rod lens endoscopy of the lower urinary tract: a prospective controlled comparison. J Urol 1984;131:715-6.
2. Engelsgjerd JS, Deibert CM. Cystoscopy. Treasure Island (FL): StatPearls Publishing; 2025.
3. Khan J, Kamal MS, D'Arcy FT, et al. Biopsy at flexible cystoscopy: is it worthwhile? Ir J Med Sci 2021;190:437-9.
4. Zeng S, Zhang Z, Bai Y, et al. Antimicrobial agents for preventing urinary tract infections in adults undergoing cystoscopy. Cochrane Database Syst Rev 2019;2:CD012305.
5. Clark KR, Higgs MJ. Urinary infection following out-patient flexible cystoscopy. Br J Urol 1990;66:503-5.
6. Trail M, Cullen J, Fulton E, et al. Evaluating the Safety of Performing Flexible Cystoscopy When Urinalysis Suggests Presence of "Infection": Results of a Prospective Clinical Study in 2350 patients. Eur Urol Open Sci 2021;31:28-36.
7. Herr HW. The risk of urinary tract infection after flexible cystoscopy in patients with bladder tumor who did not receive prophylactic antibiotics. J Urol 2015;193:548-51.
8. Lee J, Kaplan-Marans E, Jivanji D, et al. Post-cystoscopy infections and device malfunctions in reprocessed flexible cystoscopes in a national database. Can J Urol 2022;29:11361-5.
9. Lightner DJ, Wymer K, Sanchez J, et al. Urologic Procedures and Antimicrobial Prophylaxis (2019). Available online: https://www.auanet.org/guidelines-and-quality/quality-and-measurement/quality-improvement/clinical-consensus-statement-and-quality-improvement-issue-brief-(ccs-and-qiib)/urologic-procedures-and-antimicrobial-prophylaxis-(2019)
10. Bootsma AM, Laguna Pes MP, Geerlings SE, et al. Antibiotic prophylaxis in urologic procedures: a systematic review. Eur Urol 2008;54:1270-86.
11. Bonkat G, Pickard R, Bartoletti R, et al. EAU guidelines on urological infections. European Association of Urology 2017;18:22-6.
12. Cusumano JA, Hermenau M, Gaitanis M, et al. Evaluation of post-flexible cystoscopy urinary tract infection rates. Am J Health Syst Pharm 2020;77:1852-8.
13. Roth V, Espino-Grosso P, Henriksen CH, et al. Office Cystoscopy Urinary Tract Infection Rate and Cost before and after Implementing New Handling and Storage Practices. Urol Pract 2021;8:23-9.
14. Early recognition of sepsis or septic shock in adults [published April 2019; amended March 2020]. Melbourne: Therapeutic Guidelines Limited; 2019. Available online: https://app.tg.org.au/viewTopic?etgAccess=true&guidelinePage=Antibiotic&topicfile=sepsis-principles-managing&guidelinename=Antibiotic&sectionId=toc_d1e347#toc_d1e347
15. Peach BC, Garvan GJ, Garvan CS, et al. Risk Factors for Urosepsis in Older Adults: A Systematic Review. Gerontol Geriatr Med 2016;2:2333721416638980.
16. Kalra OP, Raizada A. Approach to a patient with urosepsis. J Glob Infect Dis 2009;1:57-63.
17. Wagenlehner FM, Lichtenstern C, Rolfes C, et al. Diagnosis and management for urosepsis. Int J Urol 2013;20:963-70.
18. Johansen TE, Cek M, Naber KG, et al. Hospital acquired urinary tract infections in urology departments: pathogens, susceptibility and use of antibiotics. Data from the PEP and PEAP-studies. Int J Antimicrob Agents 2006;28 Suppl

1:S91-107.
19. Carey MM, Zreik A, Fenn NJ, et al. Should We Use Antibiotic Prophylaxis for Flexible Cystoscopy? A Systematic Review and Meta-Analysis. Urol Int 2015;95:249-59.
20. Lagu T, Rothberg MB, Shieh MS, et al. Hospitalizations, costs, and outcomes of severe sepsis in the United States 2003 to 2007. Crit Care Med 2012;40:754-61. Erratum in: Crit Care Med 2012;40:2932.
21. Cost of Sepsis in Australia: The George Institute of Global Health; 2021. Available online: https://www.georgeinstitute.org/sites/default/files/cost-of-sepsis-in-australian-report.pdf
22. Onderdonk AB, Winkelman JW, Orni-Wasserlauf R. Eliminating Unnecessary Urine Cultures To Reduce Costs. Laboratory Medicine 1996;27:829-32.

Cite this article as: Rahman A, Qiu M, Ravichandran K, Desai D. Cost benefit micro-analysis of performing urine cultures as a mean to reduce post-flexible cystoscopy urosepsis: a comparative study between two centres. Transl Androl Urol 2025;14(3):707-714. doi: 10.21037/tau-24-417