The use of OPAT-delivered carbapenem therapy for complicated urinary tract infections – a service evaluation

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Background

Complicated urinary tract infections (UTI) due to multidrug-resistant organisms (MDRO) constitute a growing proportion of OPAT referrals, but evidence surrounding optimal treatment approach is lacking[1]. This study aims to evaluate OPAT-delivered carbapenem therapy for UTIs, focusing on patient characteristics, treatment outcomes, bed days saved, and antimicrobial stewardship.

Methods

Data was collected retrospectively on all patients who received OPAT-delivered meropenem or ertapenem for complicated UTIs in a tertiary centre from 2014 - 2021. A descriptive analysis was performed.

Table1. Patient characteristics

Patient characteristics		**Total (n = 53)**
Age (Years): median [IQR]		59 [46,74]
Sex (Male): n (%)		25 (47%)
Risk Factors: n (%)	Transplant	14 (26%)
	Diabetes mellitus	15 (28%)
	Obstructive uropathy	22 (42%)
	Incomplete voiding	1 (2%)
	Vesicoureteral reflux	1 (2%)
	Instrumentation in past 1/12	4 (7%)
	Polycystic kidney disease	5 (9%)
	Foreign body:	19 (34%)
	Nephrostomy	1 (5%)
	JJ stent	5 (28%)
	Catheter	9 (50%)
	Self - catheter	3 (17%)
Imaging: n (%)		36 (68%)
Abscess: n (%)		1 (2%)

Results

Carbapenem-based OPAT for complicated UTIs was delivered over 53 episodes to 45 patients, of whom 25 (47%) were male and the median age was 59 years (IQR 46-74). Regarding risk factors, 22 (42%) had obstructive uropathy, 18 (34%) had a urinary tract foreign body (catheter, stent or nephrostomy), 15 (28%) had diabetes mellitus, and 14 (26%) had a renal transplant. An abscess was identified on imaging in one patient. [Table 1]

The majority of infections were microbiologically-confirmed, with 47 (89%) positive urine cultures and 16 (30%) positive blood cultures. *E. coli* was cultured from 28 (53%) specimens, followed by *Klebsiella pneumoniae* in 15 (28%). Most isolates (n=46; 87%) were extended-spectrum beta-lactamase (ESBL) producers, with three (6%) MDROs with unspecified resistance mechanisms. All patients had a history of current or previous MDRO growth. [Table 2]

Table 2. Microbiology findings

Microbiology findings		**Total (n = 53)**
Culture positive: n (%)		50 (94%)
	Urine	47 (89%)
	Blood	16 (30%)
Organism: n (%)	*E. coli*	28 (53%)
	Klebsiella pneumoniae	15 (28%)
	Proteus mirabilis	1 (2%)
	Pseudomonas aeruginosa	1 (2%)
	Other	2 (4%)
	Mixed growth	3 (6%)
Resistance pattern: n (%)	ESBL producer	46 (87%)
	MDRO (not ESBL)	3 (6%)
	Other	1 (2%)

Most OPAT episodes were completed on ertapenem (n=39; 74%), with 14 (26%) on meropenem. The median length of hospital stay was 6 days (IQR 4-9) and median length of parenteral therapy was 12 days (IQR 9-14). The median number of bed days saved due to OPAT was 7 days (IQR 5-8). The total number of bed days saved was 402. Overall, 15% of patients (21% meropenem group, 13% ertapenem group) required further treatment for UTI within one month of treatment cessation, indicating the high incidence of underlying risk factors for complicated UTI. [Table 3]

Table 3. Results

Results		**Total (n = 53)**
Length of hospital stay (days): median [IQR]		6 [4,9]
Length of IV therapy (days): median [IQR]		12 [9,14]
Bed days saved: median [IQR]		7 [5,8]
OPAT agent: n (%)	Ertapenem	39 (74%)
	Meropenem	14 (26%)
Clinical Cure*: n (%)	Total	45/53 (85%)
	Ertapenem	34/39 (87%)
	Meropenem	11/14 (79%)
**no further treatment within 1/12 of treatment cessation*		

Conclusion

Carbapenem therapy for a median duration of 12 days resulted in clinical cure of 85% of complicated UTIs in a patient cohort with a high proportion of risk factors. We demonstrated the use of carbapenems was driven by microbiology results, with current or previous MDRO growth in all cases. A total of 402 hospital bed days were saved through the utilisation of OPAT.

Sources
1. Fink DL, Collins S, Barret R, Pollara G, Marks M, Logan S. Shortening duration of ertapenem in outpatient parenteral antimicrobial therapy for complicated urinary tract infections: A retrospective study. PLoS One. 2019 Sep 26;14(9).

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