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Research Paper

Patterns and Practice of Intravenous-to-Oral Antibiotic Conversion in a Tertiary Care Hospital: A Prospective Observational Study

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ABSTRACT

Background: Intravenous (IV) antibiotic therapy is the standard of care for moderate-to-severe infections in hospitalised patients, but prolonged parenteral therapy increases the risk of catheter-related complications, raises healthcare costs, and prolongs hospital stay. Timely conversion to oral (PO) therapy is a recognised antimicrobial stewardship strategy; however, structured conversion programmes remain inconsistently implemented across tertiary care hospitals in India.Objectives: To evaluate the practice of IV-to-PO antibiotic conversion, characterise conversion types, and determine whether the timing of conversion (in-hospital versus at discharge) influences the length of hospital stay (LOHS).Methods: A prospective observational study was conducted over six months across four inpatient departments General Surgery, Obstetrics and Gynaecology (OBG), Orthopaedics, and General Medicine at Karpagam Faculty of Medical Sciences and Research, Coimbatore. All adult inpatients who received at least 48 hours of IV antibiotic therapy subsequently converted to an oral formulation were enrolled. Data were collected using a structured case report form. Conversion type was classified as switch, sequential, or step-down. LOHS was compared between conversion groups using the Mann-Whitney U test (IBM SPSS v25).Results: A total of 155 patients were enrolled (63% female; modal age group 45-54 years, 23%). General Surgery contributed the highest conversion volume (46%), followed by OBG (28%). Culture sensitivity testing was performed in only 21% of patients. Cefotaxime was the most frequently converted antibiotic (39%), with third-generation cephalosporins collectively accounting for 73% of all conversions. Switch conversion was the predominant strategy (65%). The mean IV and oral antibiotic durations were 4.3 and 3.5 days, respectively. In-hospital conversion was performed in 103 patients (mean LOHS: 7.30 days) and discharge conversion in 52 (mean LOHS: 6.92 days); the difference was not statistically

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significant (Mann-Whitney U = 2277.5; p = 0.125). Conversion type distribution differed significantly by department (χ^2 = 18.18, df = 6; p = 0.006).Conclusion: IV-to-PO antibiotic conversion is routinely practised across all four departments. The timing of conversion does not significantly affect LOHS, supporting the safety of early in-hospital switching. The low rate of culture-guided prescribing (21%) and significant inter-departmental variation in conversion strategy both indicate the urgent need for formalised, department-specific antimicrobial stewardship protocols

INTRODUCTION

Infectious diseases remain a leading cause of hospital admissions worldwide. According to the World Health Organization, lower respiratory infections, diarrhoeal diseases, tuberculosis, and HIV/AIDS together account for millions of deaths each year, with India carrying a disproportionate burden particularly for tuberculosis, which represents 26% of the global caseload.[1] The management of these infections in hospitalised patients almost invariably begins with IV antibiotic therapy, which offers precise dosage control, immediate systemic distribution, and the flexibility to adjust treatment rapidly.[2]

However, prolonged IV therapy carries real risks. Catheter-related bloodstream infections, phlebitis, thrombosis, fluid and electrolyte imbalances, and drug-interaction complications are well-documented consequences of extended parenteral access.[3] Beyond clinical risks, IV therapy requires continuous nursing input and hospital-level infrastructure, both of which add significantly to the cost of care.[4]

IV-to-PO antibiotic conversion the planned transition from parenteral to oral therapy once a patient is clinically stable and able to tolerate oral medications addresses each of these concerns. It eliminates the need for vascular access, reduces infection and thrombosis risk, improves patient mobility, enables earlier discharge, and substantially lowers treatment costs without compromising therapeutic outcomes.[5],[6] These advantages have made IV-to-PO conversion a core element of antimicrobial stewardship programmes (AMSPs) recommended by the WHO, the Infectious Diseases Society of America, and multiple national bodies.

Three conversion strategies are recognised in clinical practice.[7] Sequential therapy replaces a parenteral agent with the same compound orally for example, levofloxacin 500 mg IV switched to levofloxacin 500 mg PO. Switch therapy substitutes an IV agent with a different compound within the same class at comparable potency for example, cefazolin IV converted to cefalexin PO. Step-down therapy moves to an oral agent of narrower spectrum, different class, or lower dose for example, ampicillin-sulbactam IV converted to amoxicillin-clavulanate PO.

Eligibility for conversion requires an intact and functional gastrointestinal tract, documented clinical improvement (afebrile or temperature trending down, white blood cell count normalising), and the absence of conditions mandating IV-only therapy such as meningitis, endocarditis, or septic shock.[8]

Despite the evidence base, IV-to-PO conversion remains underused or inconsistently applied in Indian tertiary care hospitals. Published data from South India are limited, and head-to-head comparisons of conversion timing and its effect on LOHS are rarely reported. This study addresses these gaps by documenting conversion practices across four inpatient departments and examining the relationship between conversion timing and LOHS.

2. MATERIALS AND METHODS

2.1 Study Design

This was a prospective, single-centre, observational study conducted over a six-month period (May to October 2023) at Karpagam Faculty of Medical Sciences and Research

(KFMSR), Coimbatore, Tamil Nadu—a 750-bed tertiary care teaching hospital. The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Ethics Committee (IEC Ref: KCP/IEC/2022-23/11). Written informed consent was obtained from all participants prior to enrolment.

2.2 Study Setting

Data were collected from four inpatient departments: General Medicine, General Surgery, Obstetrics and Gynaecology (OBG), and Orthopaedics.

2.3 Participants

***Inclusion* criteria:** (1) Inpatients ≥18 years of age; (2) received IV antibiotic therapy for at least 48 hours; (3) clinically improving and haemodynamically stable; (4) able to tolerate oral medications (tablets or capsules); and (5) IV antibiotic subsequently converted to an oral formulation during the study period.

Exclusion *criteria*: (1) Patients unable to tolerate oral medications; (2) pregnant or lactating women; (3) patients clinically not improving or haemodynamically unstable; (4) nil per os (NPO) or unconscious patients without enteral access; and (5) patients with malignancies or life-threatening conditions requiring prolonged IV therapy.

2.4 Sample Size

The target sample size was 200 ± 50, calculated using standard sample size estimation methods for observational studies. A total of 155 patients met the eligibility criteria and were enrolled over the study period.

2.5 Data Collection

A structured data collection form was used to capture: patient demographics (age, sex, ward/department); primary diagnosis; IV antibiotic(s) used including name, dose, frequency, and duration; culture sensitivity test result (if performed); oral antibiotic(s) prescribed post-conversion; conversion type (switch, sequential, or step-down); site of conversion (in-hospital or at discharge); and total LOHS. Data were extracted from medication charts and case notes by trained Pharm.D. investigators under direct faculty supervision.

2.6 Definitions

Switch therapy: IV antibiotic discontinued and replaced by a different compound of the same class at comparable potency, administered orally. Sequential therapy: the same antibiotic compound continued orally at an equivalent dose after IV discontinuation. Step-down therapy: IV antibiotic replaced by an oral agent of lower spectrum, different class, or reduced dose. LOHS was calculated as the number of inpatient days from admission to discharge.

2.7 Statistical Analysis

Data were entered in Microsoft Excel and analysed using IBM SPSS Statistics v25. Descriptive statistics frequencies, percentages, and means were used to summarise all variables. The chi-square test assessed associations between categorical variables (gender, department, culture test status) and conversion type. Because LOHS did not follow a normal distribution, the Mann-Whitney U test was used to compare LOHS between in-hospital and discharge conversion groups. A p-value < 0.05 was considered statistically significant.

3. RESULTS

3.1 Age Distribution

A total of 155 patients met the inclusion criteria. The study population was distributed across seven age groups (Table 1). The largest cohort was aged 45–54 years (36 patients, 23%), followed by 35-44

years and 55-64 years (34 patients each, 22%). The smallest group was 75–85 years (4 patients, 2%). The broad age range demonstrates that IV-to-PO conversion is practised across all adult age groups.

Table 1: Age distribution of the study population (n = 155)

Age Group (years)	No. of Patients (n = 155)	Percentage (%)
18-24	14	9
25-34	18	12
35-44	34	22
45-54	36	23
55-64	34	22
65-74	15	10
75-85	4	2

3.2 Gender Distribution

Female patients constituted the majority at 97 (63%), compared to 58 male patients (37%) (Table 2). The female predominance reflects the high contribution from the OBG department, where conversions were performed predominantly in post-operative obstetric and gynaecological patients.

Table 2: Gender distribution (n = 155)

Gender	No. of Patients (n = 155)	Percentage (%)
Female	97	63
Male	58	37

3.3 Departmental Distribution

General Surgery accounted for the highest number of conversions with 72 patients (46%), followed by OBG with 43 patients (28%), Orthopaedics with 26 patients (17%), and General Medicine with 14 patients (9%) (Table 3). The surgical departments together contributed 73% of all conversions, consistent with the higher frequency of prophylactic antibiotic prescribing in peri-operative settings.

Table 3: Distribution of patients by department (n = 155)

Department	No. of Patients (n = 155)	Percentage (%)
General Surgery	72	46
Obstetrics & Gynaecology	43	28
Orthopaedics	26	17
General Medicine	14	9

3.4 Culture Sensitivity Testing

Culture sensitivity testing was performed in only 32 patients (21%). The remaining 123 patients (79%) received antibiotics and were converted empirically without microbiological confirmation (Table 4). This finding indicates that empirical antibiotic prescribing is the predominant approach, limiting the ability to tailor therapy to documented pathogens and resistance profiles.

Table 4: Culture sensitivity test status (n = 155)

Culture Test	No. of Patients (n = 155)	Percentage (%)
Performed	32	21
Not Performed	123	79

3.5 Commonly Converted Antibiotics

Among the 155 conversion episodes, Cefotaxime was the most frequently converted antibiotic (61 patients, 39%), followed by Cefoperazone-Sulbactam (32, 21%), Metronidazole (25, 16%), and Ceftriaxone-Sulbactam (21, 13%) (Table 5). Third-generation cephalosporins collectively accounted for 114 conversions (73%), reflecting their broad-spectrum activity and the availability of suitable oral equivalents within the same class.

Table 5: Antibiotic agents involved in IV-to-PO conversion (n = 155)

Antibiotic	No. of Patients (n = 155)	Percentage (%)
Cefotaxime	61	39
Cefoperazone + Sulbactam	32	21
Metronidazole	25	16
Ceftriaxone + Sulbactam	21	13
Piperacillin + Tazobactam	9	6
Amikacin	3	2
Amoxicillin + Clavulanate	2	1
Levofloxacin	1	<1
Ofloxacin + Ornidazole	1	<1

3.6 Timing of Conversion

The majority of conversion 103 patients (72%) were performed while the patient was still hospitalised. Conversion was made at the time of ischarge in the remaining 52 patients (28%) (Table 6).

Table 6: Timing of IV-to-PO conversion (n = 155)

Conversion Timing	No. of Patients (n = 155)	Percentage (%)
In-Hospital	103	72
At Discharge	52	28

3.7 Type of Conversion

Switch conversion was the most frequently used strategy (100 patients, 65%), followed by sequential conversion (28, 18%) and step-down conversion (27, 17%) (Table 7). The predominance of switch therapy reflects the use of third-generation cephalosporins, which are routinely switched to oral equivalents within the same class.

Table 7: Type of IV-to-PO conversion (n = 155)

Conversion Type	No. of Patients (n = 155)	Percentage (%)
Switch	100	65
Sequential	28	18
Step-Down	27	17

3.8 Duration of Antibiotic Therapy

The mean duration of IV antibiotic therapy prior to conversion was 4.3 days, and the mean oral antibiotic duration post-conversion was 3.5 days (Table 8), giving a combined mean treatment duration of approximately 7.8 days.

Table 8: Mean duration of IV and oral antibiotic therapy (n = 155)

Route	Mean Duration (days)
Intravenous (IV)	4.3
Oral (PO)	3.5

3.9 Length of Hospital Stay

The mean LOHS was 7.30 days for in-hospital conversion patients and 6.92 days for discharge conversion patients (Table 9). Mann-Whitney U test yielded U = 2277.5 (Z = –1.535; p = 0.125), indicating no statistically significant difference in LOHS between the two groups. The overall mean LOHS across all 155 patients was 7.17 days (SD = 2.98; range 2–19 days).

Table 9: Length of hospital stay by conversion timing – Mann-Whitney U test results

Conversion Group	n	Mean LOHS (days)	Mann-Whitney U	p
In-Hospital Conversion	103	7.30	2277.5	0.125
Discharge Conversion	52	6.92	—	—
Overall	155	7.17 (SD 2.98)	—	—

LOHS = Length of Hospital Stay. p > 0.05 indicates no statistically significant difference between groups.

3.10 Conversion *Type by Gender, Department, and Culture Status*

Table 10 presents cross-tabulations of conversion type against gender, department, and culture test status. No significant association was found between gender and conversion type (χ^2 = 1.75, df

= 2; p = 0.418) or between culture test performance and conversion type (χ^2 = 3.21, df = 2; p = 0.201). However, conversion type distribution differed significantly across departments (χ^2 = 18.18, df = 6; p = 0.006), with Orthopaedics showing the highest proportion of switch conversion (88.5%) and General Medicine the highest proportion of step-down conversion (42.9%).

Table 10: Conversion type by gender, department, and culture status with chi-square results (n = 155)

Variable	Sequential n (%)	Step-down n (%)	Switch n (%)	Total	χ^2 (df); p-value
Female	19 (19.6%)	14 (14.4%)	64 (66.0%)	97	1.75 (2); p = 0.418
Male	9 (15.5%)	13 (22.4%)	36 (62.1%)	58	
General Surgery	14 (19.4%)	14 (19.4%)	44 (61.1%)	72	18.18 (6); p = 0.006*
Obstetrics & Gynaecology	12 (27.9%)	4 (9.3%)	27 (62.8%)	43	
Orthopaedics	0 (0.0%)	3 (11.5%)	23 (88.5%)	26	
General Medicine	2 (14.3%)	6 (42.9%)	6 (42.9%)	14	
Culture Test Done	5 (15.6%)	9 (28.1%)	18 (56.3%)	32	3.21 (2); p = 0.201
No Culture Test	23 (18.7%)	18 (14.6%)	82 (66.7%)	123	

** Statistically significant (p < 0.05). χ^2 = Pearson chi-square; df = degrees of freedo*

DISCUSSION

This study characterises IV-to-PO antibiotic conversion practices across four inpatient departments at a tertiary care hospital in South India and generates several findings that are directly actionable for antimicrobial stewardship.

The modal patient age of 45–54 years is consistent with earlier Indian reports Tejaswini et al. found the highest conversion frequency in the 51-60 year group and confirms that conversion practice is not age-specific but is driven by clinical indication and patient stability.[13] The female predominance in this cohort (63%) contrasts with male-majority series from Lebanon and other settings[9],[15] and is directly attributable to the high OBG volume, where post-operative antibiotic prophylaxis is routinely converted to oral therapy within 24-48 hours of an uncomplicated procedure.

The dominance of General Surgery (46%) and OBG (28%) mirrors findings reported by Sevinc et al., who observed higher conversion rates in surgical than in medical departments.[16] This pattern is explained by the nature of prophylactic prescribing in surgical specialties: courses are typically short, infection is often not established, and patients are haemodynamically stable all conditions that favour early oral switching. The comparatively low conversion volume in General Medicine (9%) likely reflects greater infection severity, more comorbidity, and higher uncertainty about clinical trajectory, factors that make prescribers more reluctant to convert.

The low rate of culture sensitivity testing (21%) is the most clinically concerning finding in this study. When 79% of conversions are made empirically without microbiological confirmation of the causative organism or its susceptibility pattern there is no mechanism to verify that the chosen oral agent will adequately cover the pathogen, nor to narrow therapy once a less resistant organism is identified. This pattern is not unique to this hospital: multiple Indian studies have reported similarly low culture-testing rates in the context of IV-to-PO conversion.[9],[13] The absence of a significant association between culture-test status and conversion type ($p = 0.201$) indicates that when sensitivity results were obtained, they did not systematically change the conversion strategy a gap between data availability and its application at the bedside.

Cephalosporins accounted for 73% of all conversions, with Cefotaxime as the single most converted agent (39%). This is consistent with the Kerala-based findings of Tamilselvan et al. and reflects the combination of broad-spectrum third-generation cephalosporin use in surgical prophylaxis and the ease of switching within the cephalosporin class.[9] Metronidazole (16%) appears frequently as a co-prescribed agent for anaerobic cover, particularly in abdominal and gynaecological cases. The low conversion rate for Piperacillin-Tazobactam (6%) and Amikacin (2%) is pharmacologically appropriate, as suitable oral equivalents for these agents are either unavailable or unsuitable for most common indications.

Switch conversion was the predominant strategy (65%), which differs from the Palakkad series reported by Raju et al. where step-down was most frequent (45.3%), and from the Lebanese series of Shrayteh et al. where sequential conversion led (52.5%).[14],[15] These inter-study differences likely reflect local formulary differences, infection case-mix, and prescriber preference rather than evidence-based protocol adherence a point reinforced by the statistically significant variation in conversion type across departments in this study ($p = 0.006$). Orthopaedics favoured switch conversion at 88.5%, which is consistent with the use of prophylactic cefazolin switched to oral cefalexin in elective joint and long-bone procedures. General Medicine's higher use of step-down conversion (42.9%) reflects the broader range of infections encountered and greater heterogeneity in prescribing decisions.

The mean IV therapy duration of 4.3 days before conversion is shorter than the 6.0 days reported by Sevinc et al.[16] The difference is likely attributable to the high proportion of prophylactic surgical cases in this cohort, where IV-to-PO conversion guidelines typically recommend switching at 24–48 hours post-operatively in uncomplicated cases. The 3.5-day oral phase is consistent with short-course prophylaxis guidelines.

The primary outcome LOHS by conversion timing showed no statistically significant difference between in-hospital (7.30 days) and discharge (6.92 days) conversion groups ($p = 0.125$). This is the most important finding for clinical practice: it confirms that converting patients to oral therapy while still admitted does not prolong their stay, which is the concern most frequently cited by prescribers who delay or defer conversion to the point of discharge. Shrayteh et al. reported a similarly negligible difference in LOHS between converted and non-converted patients (6.61 versus 6.69 days).[15] The finding directly supports AMSP protocols that target early in-hospital conversion as a safe default.

Several limitations should be noted. The six-month observation window constrains sample size and may not capture seasonal infection pattern variation. The absence of a non-converted comparator group prevents LOHS benchmarking against patients who remained on IV therapy throughout their stay. The low culture-testing rate limits pathogen-specific subgroup analyses.

Comorbidity burden, functional status, and pharmacoeconomic outcomes were not captured. These limitations define the scope of conclusions and frame a clear agenda for larger, multi-centre studies with controlled comparators.

CONCLUSION

IV-to-PO antibiotic conversion is practised routinely across all four departments studied, with third-generation cephalosporins and switch-type conversion as the dominant patterns. The timing of conversionin-hospital or at discharge does not significantly affect LOHS, providing direct support for earlier, protocol-driven in-hospital switching. The low rate of culture-guided prescribing (21%) and the significant variation in conversion strategy across departments both point to the absence of a formal, evidence-based conversion protocol at the institutional level. Implementing a department-specific antimicrobial stewardship programme with explicit IV-to-PO conversion criteria, culture-guided decision triggers, and pharmacy-led daily review is the most actionable response to these findings. Future studies should include non-converted comparison groups, resistance profiling, and cost analyses to build the full evidence base for programme adoption in the Indian tertiary care setting.

DECLARATIONS

Ethics Approval: This study was approved by the Institutional Ethics Committee of Karpagam College of Pharmacy (Ref: KCP/IEC/2022-23/11). All participants provided written informed consent prior to enrolment.

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Conflicts of Interest: The authors declare conflicts of interest.

Data Availability: Anonymised data supporting the findings of this study are available from the corresponding author on reasonable request.

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