Impact of a Carbapenem Prescribing Protocol on Prescribing Appropriateness in a General Medicine Department

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Background

Carbapenems are essential for the treatment of severe infections caused by multidrug-resistant (MDR) Gram-negative organisms. However, inappropriate use contributes to the emergence of antimicrobial resistance.

Antimicrobial stewardship programmes (ASPs) play a key role in optimising carbapenem prescribing practices.

This study evaluated the impact of a structured carbapenem prescribing protocol on the appropriateness of initial carbapenem orders in the General Medicine Department of a large 1,000-bed general hospital in Singapore.

Methodology

A prospective, single-centre quality improvement study was conducted in the General Medicine Department at Sengkang General Hospital (SKH), Singapore, between September 2024 and September 2025.

As part of the institutional antimicrobial stewardship programme (ASP), a mandatory carbapenem prescribing protocol was implemented on 1 September 2024 to optimise carbapenem use and enhance prescribing appropriateness.

The primary outcome was the proportion of appropriate initial carbapenem prescriptions, assessed according to local institutional guidelines.

Secondary outcomes included monthly carbapenem utilisation and the identification of recurring themes contributing to inappropriate prescribing through prospective audit and review.

a) Intervention

- Senior physician (i.e. senior registrar level and above) approval was required for all carbapenem initiation.
- Mandatory documentation of the following was required upon carbapenem initiation
    1. Indication for carbapenem therapy
    2. Planned review / de-escalation date
    3. Name of senior physician authorising carbapenem initiation

b) Prospective Audit

- ASP pharmacists prospectively reviewed all initial carbapenem prescriptions from September 2024 to September 2025
- Audits were conducted within 24–72 hours of carbapenem initiation to assess appropriateness
- Prescribing appropriateness was assessed against local institutional guidelines

c) Guidelines for Empiric Use of Carbapenems

Empiric Use Criteria (to fulfil one of the following)	
A	Sepsis + Clinically unwell + Onset of infection either nosocomial (>48 hours after admission) or healthcare-associated
B	Severe nosocomial or healthcare associated infection + Fail to improve after 48-72 hours of empiric therapy + Appropriate cultures remain negative
C	Empiric therapy for nosocomial organ infection when delay in appropriate therapy could pose catastrophic risk (e.g. brain abscess, mediastinitis etc.)

d) Feedback & Education

- Inappropriate carbapenem prescriptions were reviewed to identify recurring prescribing trends and misconceptions regarding indications for use.
- Audit findings were shared at departmental meetings every 6 months to reinforce antimicrobial stewardship practices.
- Targeted feedback and education were provided directly to teams with recurrent inappropriate carbapenem prescribing.

Results

- Prior to protocol implementation, monthly carbapenem prescribing appropriateness ranged from 85-88% per month.
- Between September 2024 and September 2025, monthly carbapenem utilisation ranged from 64 to 103 prescriptions.
- Overall prescribing appropriateness remained high throughout the study period, with appropriate initial carbapenem prescribing rates ranging from 82.4% to 93.8% (Figure 1).

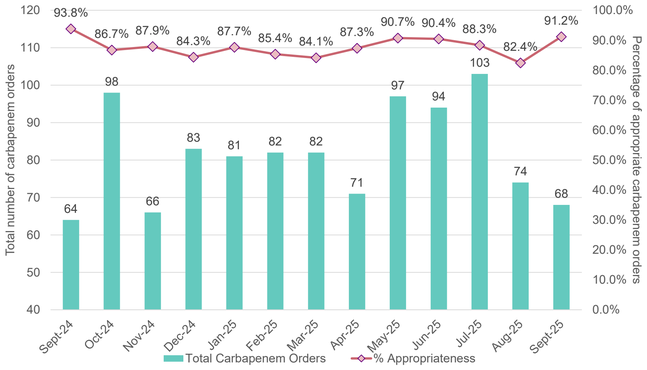

Figure 1. Total number of carbapenem orders and percentage of appropriate orders per month

- Appropriate prescribing remained consistently above 80% throughout the study period despite fluctuations in prescribing volume.
- Some month-to-month variation in appropriateness rates was observed, which may have been influenced by lower prescription volumes during certain months.
- Prospective audit findings identified 2 main themes contributing to inappropriate carbapenem use (Figure 2).

Key Themes Identified from Prospective Carbapenem Audit

Inappropriate Carbapenem Use (“Overuse”)	Clinical Uncertainty in Critically Ill Patients

Summary of Audit Findings

Over-reliance on historical microbiological culture results to justify empiric carbapenem therapy, particularly in clinically stable patients presenting with community-acquired infections without features of severe sepsis or septic shock.	Prescribers frequently faced uncertainty when managing critically ill patients with severe sepsis or septic shock who had a history of MDR Gram-negative infections within the preceding months.

Targeted Stewardship Interventions

Targeted educational outreach and prospective “handshake stewardship” interventions were implemented among teams identified as recurrent prescribing outliers. These interventions included case-based discussions, reinforcement of antimicrobial stewardship principles, and clarification of appropriate indications for empiric carbapenem therapy.	Revised recommendations in July 2025 to incorporate guidance supporting empiric carbapenem therapy in clinically unstable or septic patients with MDR Gram-negative organisms isolated within the preceding three months, while continuing to discourage unnecessary carbapenem use in clinically stable community-onset infections.

Figure 2. Summary of main themes identified contributing to inappropriate carbapenem utilisation

- Subsequent audits demonstrated progressive improvement in prescribing consistency and guideline adherence.

Conclusions

Implementation of a mandatory carbapenem prescribing protocol, supported by prospective audit and targeted feedback, maintained high prescribing appropriateness while enabling identification of recurring drivers of inappropriate use. Audit-informed stewardship interventions and guideline refinement improved prescribing consistency and reinforced appropriate carbapenem use. Ongoing surveillance and education remain essential to sustain these gains.