Intravenous-to-Oral Antibiotic Switching in Hospitalized Patients: Clinical Criteria, Evidence-Based Strategies, and Practical Applications

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ABSTRACT

Intravenous (IV) antibiotics are frequently initiated in hospitalized patients when infection is severe, oral intake is unreliable, or rapid and predictable systemic drug exposure is required. Nevertheless, the need for parenteral treatment should be reassessed as the clinical course evolves. In patients who improve, have a functioning gastrointestinal tract and have an active oral option with adequate exposure at the site of infection, conversion to oral therapy can preserve effective treatment while avoiding unnecessary vascular access and administration burden. This narrative review examines the pharmacological principles, clinical criteria, infection-specific applications and implementation strategies for IV-to-oral antibiotic switching. Evidence from community-acquired pneumonia, complicated urinary tract infection, bloodstream infection and bone and joint infection is considered alongside national switching criteria and antimicrobial stewardship recommendations. Safe conversion requires more than defervescence: haemodynamic stability, improving clinical findings, source control, microbiological susceptibility, reliable absorption, appropriate dose and feasible follow-up must be assessed together. Oral bioavailability is important but does not by itself establish

equivalence; drug exposure, tissue penetration, pathogen susceptibility and infection characteristics remain decisive. Selected patients with pneumonia, urinary infection and uncomplicated Gram-negative bacteraemia may be suitable for oral step-down treatment, while endocarditis, meningitis, persistent bacteraemia, uncontrolled deep infection and certain device-associated infections require specialist-directed decisions. Structured review within 24–48 hours, followed by daily reassessment when IV therapy continues, can improve consistency and reduce missed opportunities. IV-to-oral switching is therefore best understood as an individualized clinical decision and a core antimicrobial stewardship intervention, not as a mandatory time-based rule.

Keywords: Intravenous-to-oral switch; Oral step-down therapy; Antimicrobial stewardship; Antibiotic bioavailability; Hospitalized patients; Clinical stability; Bloodstream infection.

1.INTRODUCTION

Intravenous antibiotic treatment is a familiar component of acute hospital care. It is often selected at presentation when a patient has sepsis, severe pneumonia, complicated urinary infection, extensive soft-tissue infection or another condition in which oral administration may be unreliable. The intravenous route bypasses gastrointestinal absorption and provides complete systemic bioavailability. These features are valuable during initial resuscitation and in patients who cannot swallow, are vomiting, have impaired intestinal function or require an antimicrobial for which no suitable oral formulation exists.

However, the route that is appropriate at admission may not remain necessary throughout the admission. As infection responds, circulation stabilizes, oral intake returns and microbiological information becomes available, the balance of benefit and risk may change. Continuing intravenous therapy without a continuing indication exposes patients to cannula-related pain, phlebitis, infiltration, thrombosis and catheter-associated infection. It also consumes nursing time, equipment and hospital resources, and may delay discharge when intravenous administration is the only remaining inpatient requirement [1-2].

Intravenous-to-oral antibiotic switching (IVOS), also termed sequential therapy or oral step-down treatment, is the planned replacement of parenteral antimicrobial therapy with an effective oral regimen during the same treatment episode. It should be distinguished from stopping antibiotics, narrowing the antimicrobial spectrum and discharging a patient; these decisions may occur together, but they are not identical. At every review, clinicians should first determine whether an antibiotic is still indicated. If treatment remains necessary, the next question is whether an oral regimen can deliver adequate antimicrobial exposure safely.

Stewardship guidance from the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America recommends programmes that promote appropriate initial oral therapy and timely transition from intravenous to oral treatment. National IVOS criteria published by the UK government in 2024 provide a structured framework for review within 48 hours and daily reassessment thereafter [2]. Similar operational guidance emphasizes that the oral route should be used when clinically reliable and pharmacologically appropriate [3]. These recommendations support a systematic process, but they do not replace infection-specific judgment. The purpose of this narrative review is to summarize the rationale, pharmacological foundations, patient-selection criteria, evidence base and practical implementation of IV-to-oral antibiotic switching in hospitalized adults. Particular attention is given to common infection syndromes, complicated situations, antimicrobial stewardship and areas where evidence remains uncertain

2. RATIONALE AND CLINICAL VALUE OF SWITCHING

2.1 Avoiding unnecessary vascular access

Peripheral cannulas and central vascular devices are not biologically neutral. They can cause local inflammation, extravasation, occlusion, thrombosis and infection. The risk increases with device duration, repeated insertion and patient-specific factors. Avoiding an unnecessary line is therefore a direct patient-safety benefit, particularly when the line is maintained solely to administer an antibiotic that has an effective oral alternative. In the OVIVA randomized trial programme, catheter complications were substantially more frequent in participants allocated to intravenous therapy than in those allocated to oral treatment; the published Health Technology Assessment report provides the detailed trial findings [4].

2.2 Patient comfort, mobility and quality of care

Oral treatment generally permits greater freedom of movement, reduces interruptions for infusions and may make rehabilitation easier. Patients can often eat, sleep and participate in physiotherapy without being connected to infusion equipment. Oral therapy may also simplify medication administration for patients transferred between wards or discharged with a continuing treatment plan. These benefits are relevant to older adults, patients recovering from surgery and individuals who need to regain independence before discharge.

2.3 Resource use and hospital flow

Intravenous therapy requires drug preparation, compatible fluids and administration devices, line maintenance and observation for infusion reactions. A safe oral switch can reduce these activities and may shorten hospital stay when no other inpatient care is required. In a randomized study of severe community-acquired pneumonia, switching clinically stable patients after three days of intravenous treatment produced similar clinical cure and mortality outcomes to a longer intravenous strategy, while reducing intravenous treatment duration and length of stay. The reduction in hospital stay should not be promised for every patient: investigations, oxygen needs, rehabilitation, social circumstances and other medical problems may remain the actual determinants of discharge [5].

2.4 Stewardship and spectrum optimization

An IV-to-oral review is also an opportunity to reassess whether the current antibiotic is still needed and whether its spectrum can be narrowed. Empirical broad-spectrum therapy may have been justified at presentation, but cultures, imaging and clinical evolution can identify a narrower option. Switching should therefore be integrated with antibiotic time-outs, review of treatment duration and source-control assessment. A route change that simply transfers an unnecessarily broad regimen to an oral formulation is not optimal stewardship.

3. PHARMACOLOGICAL FOUNDATIONS OF ORAL STEP-DOWN THERAPY

3.1 Oral bioavailability and systemic exposure

Bioavailability describes the fraction of an administered dose that reaches the systemic circulation unchanged. Intravenous administration has 100% systemic bioavailability by definition, whereas oral bioavailability varies with dissolution, intestinal absorption, first-pass metabolism, food effects and drug interactions. Some agents, including linezolid, have oral bioavailability close to that of the intravenous formulation. Selected fluoroquinolones and metronidazole also have high oral bioavailability. By contrast, several oral beta-lactams have lower or dose-dependent absorption and may require carefully selected dosing to achieve adequate exposure.

High bioavailability is helpful but is not a stand-alone switch criterion. A drug can be well absorbed yet unsuitable if the organism is resistant, the infection site is poorly penetrated, the required dose cannot be tolerated or the drug has an unacceptable safety profile. Conversely, an oral agent with lower bioavailability may still be effective for an infection in which high concentrations are achieved at the relevant site, such as selected urinary infections. The decision must connect the drug, pathogen and anatomical focus [5-6].

3.2 Pharmacokinetic/pharmacodynamic targets

Antibiotic efficacy is related to the exposure achieved relative to the pathogen's minimum inhibitory concentration (MIC). For concentration-dependent agents, the peak concentration-to-MIC ratio (Cmax/MIC) may be important. For agents whose activity is linked to total exposure, the area under the concentration-time curve-to-MIC ratio (AUC/MIC) is relevant. For time-dependent agents, the proportion of the dosing interval during which free drug concentrations remain above the MIC (fT>MIC) is a central determinant. Oral dosing schedules must therefore be chosen to achieve the exposure associated with activity for the specific antimicrobial class.

3.3 Tissue penetration and infection site

Plasma concentrations do not necessarily predict concentrations in every tissue or compartment. Antibiotic distribution into lung epithelial lining fluid, urine, prostate, bone, synovial fluid, cerebrospinal fluid and abscess cavities differs substantially. Protein binding, inflammation, pH, local blood flow and the presence of foreign material may influence penetration. A switch plan must use an agent with adequate exposure at the infected site, not simply one that is available in tablet form.

3.4 Absorption, food and drug interactions

Vomiting, severe diarrhoea, ileus, short-bowel states, malabsorption and some forms of enteral feeding can make oral exposure unreliable. Drug interactions may also reduce absorption. Fluoroquinolone absorption, for example, can be reduced by simultaneous administration of iron, calcium, magnesium or aluminium-containing products. The timing of administration should be checked against product information and local pharmacy guidance. Formulation matters: modified-release tablets, capsules and suspensions are not automatically interchangeable, and crushing a tablet may alter release or safety.

3.5 Dose selection and organ function

An oral switch is not necessarily a milligram-for-milligram substitution. The oral dose should be selected to provide adequate pharmacodynamic exposure while accounting for renal and hepatic function, body size, age, interactions and toxicity. Renal dose adjustment is particularly important for several beta-lactams, fluoroquinolones and trimethoprim-sulfamethoxazole. Therapeutic drug monitoring may be relevant for selected agents and clinical circumstances. Pharmacist or infectious diseases input is valuable when the regimen is complex, the organism has borderline susceptibility or the infection is deep seated [2,6].

Table: 1 Pharmacological factors that determine the suitability of an oral antibiotic.

Factor	Clinical question	Implication for switching
Bioavailability	Is the oral formulation absorbed reliably?	Estimate whether systemic exposure is sufficient; do not assume all oral agents are equivalent.
PK/PD target	Can the oral dose achieve the required exposure relative to MIC?	Select dose and interval according to antimicrobial class and susceptibility.
Tissue penetration	Does the drug reach the infected compartment?	Match the agent to the anatomical site and infection severity.
Gastrointestinal function	Can the patient absorb and retain oral medication?	Defer conversion if vomiting, ileus or significant malabsorption persists.
Interactions	Could food, minerals or co-medication reduce absorption or increase toxicity?	Review administration timing and concomitant medicines.
Organ function	Are renal or hepatic adjustments required?	Individualize dose and monitoring.
Adherence and access	Can the patient obtain and take the regimen?	Confirm affordability, availability, understanding and follow-up.

4. CLINICAL CRITERIA AND TIMING FOR A SAFE SWITCH

4.1 Clinical improvement

The patient should demonstrate an overall trajectory consistent with response to treatment. Relevant findings include improvement in the symptoms and signs attributable to infection, reduced oxygen or fluid requirements where applicable, improving mental status, and absence of new organ dysfunction. Clinical improvement is a pattern rather than a single observation. Persistent fatigue or a slowly resolving cough does not necessarily preclude oral treatment, while a transient temperature reduction does not establish stability in a patient with worsening perfusion or respiratory failure.

4.2 Haemodynamic and physiological stability

Haemodynamic stability means that the patient is not experiencing ongoing circulatory compromise requiring escalating resuscitation or vasopressor support. Blood pressure, heart rate, respiratory rate, oxygenation and level of consciousness should be interpreted in context. The UK national IVOS criteria include improving clinical signs, a temperature between 36°C and 38°C over the preceding 24 hours and a decreasing early warning score [2]. These are useful prompts, not universal pass/fail thresholds for every infection or every patient.

4.3 Gastrointestinal function and oral route

The patient should be able to swallow safely or receive an appropriate enteral formulation, retain medication and absorb it reliably. A feeding tube does not automatically rule out oral or enteral therapy, but compatibility with tube material, feed timing, crushing or dispersing instructions and drug absorption must be reviewed. Where absorption is uncertain, continuing parenteral treatment or selecting a different strategy may be safer.

4.4 Microbiology and availability of an active oral agent

Culture and susceptibility results should be reviewed before selecting definitive treatment whenever available. The oral agent must be active against the pathogen and achieve sufficient exposure at the infection site. If cultures are negative, empirical oral step-down may still be reasonable for a well-characterized syndrome when the likely pathogens and local resistance patterns support the regimen. In contrast, resistant organisms or limited oral options may make continued intravenous therapy necessary.

4.5 Source control and infection-specific exclusions

Antibiotics cannot compensate for an untreated focus that requires drainage, debridement, removal of infected material or relief of obstruction. Before switching, clinicians should determine whether source control has been achieved or whether a residual focus changes the treatment plan. Deep abscesses, empyema, endovascular infection, prosthetic-device infection and selected bone or joint infections warrant specialist review. The presence of bacteraemia should trigger a careful assessment of organism, source, clearance, metastatic infection and clinical stability rather than an automatic prohibition or automatic approval [3,4].

4.6 Review interval

National guidance recommends considering IVOS within 48 hours of the first intravenous antimicrobial dose and reviewing daily when the patient remains on IV therapy. This is a prompt to reassess, not a compulsory switch deadline. Some patients may be suitable earlier; others need longer parenteral therapy because of severity, absorption, source control or lack of an effective oral option. Documentation should explain why IV treatment continues when a switch is not made [2,3].

Table: 2 Practical bedside checklist before intravenous-to-oral conversion.

Domain	Questions to document	If not satisfied
Indication	Does the patient still require antibacterial treatment?	Stop if bacterial infection is no longer supported, or revise diagnosis.
Response	Are infection signs and symptoms improving?	Reassess diagnosis, pathogen, drug choice and source control.
Stability	Is the patient haemodynamically and clinically stable?	Continue appropriate acute management and review again.
Oral route	Can medication be swallowed or given enterally and absorbed?	Address nausea, swallowing or absorption; retain IV route if unreliable.
Microbiology	Is there a susceptible oral option with adequate site exposure?	Seek microbiology/ID/pharmacy advice or continue IV therapy.
Source control	Has drainage, device management or relief of obstruction been addressed?	Arrange source control and specialist review.
Safety	Are dose, renal/hepatic function, interactions and allergy history checked?	Modify regimen and monitoring before prescribing.
Continuity	Can the patient obtain, understand and complete treatment?	Resolve access, adherence and follow-up barriers.

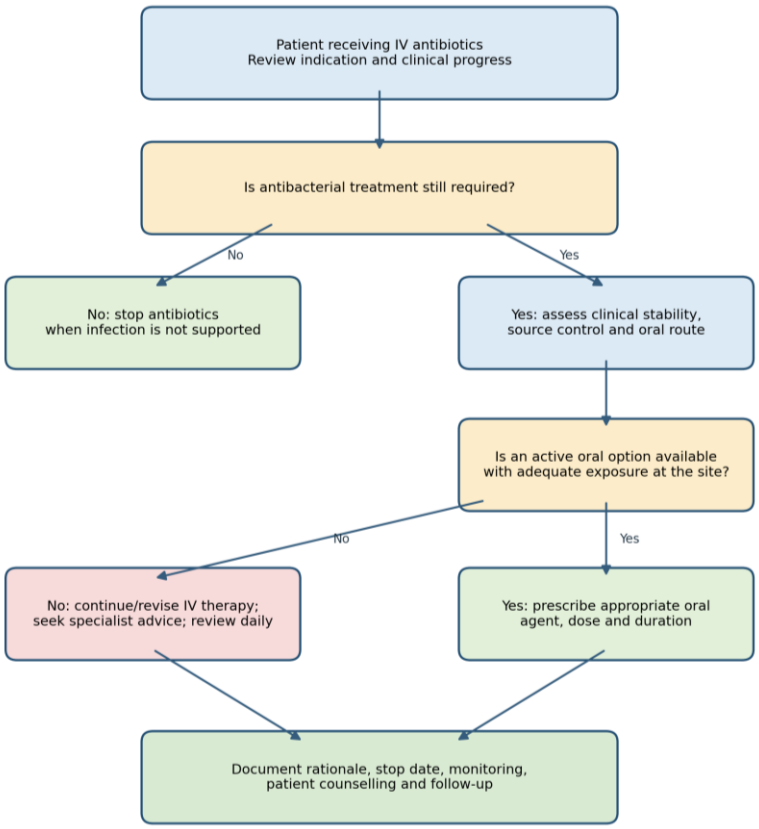

Figure: 1 Practical decision pathway for intravenous-to-oral antibiotic switching. The pathway supports structured review but does not replace infection-specific guidance or specialist assessment.

5. ANTIMICROBIAL CLASSES AND REPRESENTATIVE ORAL OPTIONS

The availability of an oral formulation is only the starting point for conversion. The drug must be active against the pathogen, suitable for the infection site and capable of achieving an adequate exposure at the intended dose. The examples below are illustrative and should not be interpreted as direct dose-equivalence instructions.

5.1 Beta-lactams

Amoxicillin, amoxicillin-clavulanate, cephalexin and selected oral cephalosporins may be used as step-down agents in susceptible infections. Oral beta-lactams differ in absorption and pharmacokinetic properties from their parenteral counterparts. A switch from ceftriaxone to an oral cephalosporin, for example, is not an automatic one-to-one substitution: spectrum, dosing frequency, susceptibility and the infection site must be checked. High-dose regimens may be required in selected settings, and the evidence supporting them varies by syndrome.

5.2 Fluoroquinolones

Ciprofloxacin and levofloxacin have high oral bioavailability and can provide systemic exposure suitable for selected infections when the pathogen is susceptible. Their use is constrained by increasing resistance and important adverse effects, including tendinopathy and tendon rupture, peripheral neuropathy, central nervous system effects, dysglycaemia and QT prolongation. They also interact with polyvalent cations. Because of these safety and resistance concerns, a fluoroquinolone should not be selected simply because it is convenient for oral step-down [6,7].

5.3 Oxazolidinones

Linezolid has near-complete oral bioavailability, so the oral formulation can provide systemic exposure similar to intravenous administration at an appropriate dose. It may be useful for selected susceptible Gram-positive infections, including some methicillin-resistant Staphylococcus aureus infections. Prolonged courses require attention to blood counts, drug interactions and the risks of neuropathy and lactic acidosis. The oral route does not reduce the need for monitoring.

5.4 Macrolides, tetracyclines and other agents

Azithromycin, clarithromycin and doxycycline may be appropriate for selected respiratory and other infections, depending on the pathogen and local recommendations. Metronidazole has good oral absorption and is commonly converted when anaerobic coverage remains indicated. Trimethoprim-sulfamethoxazole may be an option for susceptible organisms but requires consideration of renal function, potassium, blood counts, allergy and interactions. Clindamycin is available orally, although gastrointestinal adverse effects and Clostridioides difficile risk should be considered.

Table: 3 Examples of possible IV-to-oral pathways and key cautions.

IV agent or class	Possible oral option	Key cautions
Ampicillin	Amoxicillin	Confirm organism susceptibility, dose and infection site.
Ampicillin-sulbactam	Amoxicillin-clavulanate in selected infections	Ensure the oral spectrum is appropriate; not an automatic equivalent.
Cefazolin	Cephalexin in selected susceptible infections	Check pathogen, site, dose and clinical evidence.
Ceftriaxone	Selected oral beta-lactam or other active oral agent	No universal direct substitute; review susceptibility and exposure.
Levofloxacin	Levofloxacin oral	High bioavailability; consider resistance, QT and other serious adverse effects.
Ciprofloxacin	Ciprofloxacin oral	High bioavailability; consider susceptibility, interactions and safety warnings.
Linezolid	Linezolid oral	Near-complete bioavailability; monitor blood counts and interactions.
Metronidazole	Metronidazole oral	High oral absorption; confirm ongoing anaerobic indication.

6. INFECTION-SPECIFIC CLINICAL APPLICATIONS

6.1 Community-acquired pneumonia

Community-acquired pneumonia is one of the best-studied settings for sequential therapy. Patients may initially receive IV antibiotics because of hypoxaemia, systemic illness, vomiting or inability to take oral medication. Once physiological stability is achieved and oral intake is reliable, an appropriate oral regimen can usually complete treatment. The ATS/IDSA guideline for adult community-acquired pneumonia supports use of clinical stability to guide treatment decisions and recommends that duration be based on clinical response and relevant complications [6].

Clinical stability should include improvement in vital signs, oxygenation, mental status and ability to eat. Persistent radiographic opacity is not, by itself, a reason to continue IV therapy because radiological resolution often lags behind clinical recovery. Randomized trials and observational reports of early switching in severe pneumonia found similar cure and mortality outcomes compared with longer IV regimens in selected non-ICU patients, with shorter IV exposure and hospital stay. Patients with ongoing shock, escalating oxygen requirements, suspected empyema, lung abscess or an unusual pathogen need individualized assessment [5,7].

6.2 Urinary tract infection and pyelonephritis

Patients with pyelonephritis or complicated urinary tract infection may begin IV treatment when they are systemically unwell, vomiting, hypotensive or at risk of complications. Oral conversion can be considered when symptoms and physiology improve, oral intake is reliable, urinary obstruction has been relieved where present and an active oral agent achieves adequate concentrations in urine and relevant tissue. The 2025 IDSA guideline conditionally suggests transition to oral therapy in clinically improving patients with

complicated UTI, including selected patients with Gram-negative bacteraemia, when an effective oral option is available; the certainty of evidence is very low and the supporting studies generally involved stable patients with source control [8].

Choice of oral treatment should be guided by culture results and local resistance patterns. Fluoroquinolones or trimethoprim-sulfamethoxazole may be suitable when susceptibility is demonstrated and patient-specific risks are acceptable. Oral beta-lactams may be appropriate in selected cases, but dose and evidence should be considered carefully. Persistent fever should prompt evaluation for obstruction, renal or perinephric abscess, resistant organisms or an alternative diagnosis rather than simply extending IV treatment without reassessment.

6.3 Skin and soft-tissue infections

Cellulitis and other skin and soft-tissue infections may be treated initially with IV antibiotics when there is systemic illness, extensive involvement, rapid progression or inability to tolerate oral medication. When the patient is clinically improving and can take medication, oral treatment can often complete the course. Selection depends on whether streptococci, methicillin-susceptible staphylococci, MRSA or mixed organisms are suspected or confirmed. Purulent collections require drainage when indicated; antibiotic conversion without source control is unlikely to succeed in an undrained abscess. Necrotizing infection, deep infection and severe systemic toxicity require urgent surgical and specialist management.

6.4 Intra-abdominal infection

Oral step-down treatment may be considered after adequate source control in selected intra-abdominal infections, provided the patient is improving and can absorb medication. The oral regimen must cover the organisms relevant to the infection, including anaerobes when indicated. Amoxicillin-clavulanate or a combination regimen may be appropriate in selected situations, depending on local susceptibility and the source. Persistent collections, anastomotic leaks, ongoing peritonitis or inadequate drainage should lead to reassessment of source control and antimicrobial strategy. Route selection should be considered alongside the shortest effective duration after source control [8].

6.5 Bone and joint infections

Bone and joint infection has traditionally been associated with prolonged IV therapy, partly because of concern about bone penetration and the seriousness of relapse. The OVIVA trial compared oral with IV antibiotic strategies during the first six weeks of treatment for selected bone and joint infections and reported non-inferiority of oral treatment, with fewer catheter complications in the oral group. This evidence supports carefully selected oral therapy under specialist oversight, but does not imply that every osteomyelitis or septic arthritis case can be switched. Surgical management, organism, susceptibility, biofilm, retained hardware, drug penetration and adherence are central to the decision. The trial report and its applicability should be considered in the context of its defined eligibility criteria and clinical setting [4].

6.6 Gram-negative bloodstream infection

Bloodstream infection is not a single clinical entity. Oral step-down may be reasonable in selected patients with uncomplicated Gram-negative bacteraemia when the source is controlled, the patient is stable, blood cultures and susceptibility results support an effective oral agent, and there is no endovascular or metastatic focus. A large multicentre cohort of hospitalized adults with Gram-negative bloodstream infection found that oral transition was used in a substantial proportion of patients by day seven, with considerable variation between hospitals; patients remaining on IV treatment were generally more severely ill and more likely to have persistent physiological abnormalities [9]. Observational findings should not be interpreted as proof that oral conversion itself improves survival, because patients selected for switching are often less severely ill. A separate 2024 cohort analysis also demonstrated variation in timing and oral agent selection. Institutional protocols, susceptibility, source control and specialist advice are important, especially for resistant organisms, immunocompromised patients, persistent bacteraemia or uncertain source [10].

6.7 Staphylococcus aureus bacteraemia and endocarditis

Staphylococcus aureus bacteraemia carries a risk of endocarditis, metastatic infection and relapse. It should not be managed using routine oral-switch rules. Evaluation generally includes repeat blood cultures, source identification, assessment for endovascular or metastatic infection and specialist-directed treatment duration. Selected patients with specific infections may be eligible for protocolized oral strategies, but the

evidence and criteria are narrower than for uncomplicated urinary or respiratory infection. Endocarditis requires individualized infectious diseases and cardiology assessment; partial oral treatment is appropriate only in selected patients under validated specialist protocols [10].

6.8 Central nervous system infection and other deep-seated infections

Meningitis, ventriculitis, brain abscess and other central nervous system infections require reliable drug exposure in a protected anatomical compartment. Many oral agents do not achieve adequate cerebrospinal fluid or intracranial concentrations for these indications. Similarly, empyema, undrained deep abscesses, infected vascular grafts and prosthetic-device infections may require prolonged IV treatment, procedural source control or specialist-directed strategies. The decision should be based on the infection-specific evidence rather than a general preference for one route.

Table: 4 Infection-specific considerations for oral step-down therapy.

Infection syndrome	When oral conversion may be considered	Important exclusions or cautions
Community-acquired pneumonia	Clinical stability, improving oxygenation, oral intake and suitable agent.	Shock, worsening respiratory failure, empyema, abscess or unusual pathogens.
Complicated UTI/pyelonephritis	Clinical improvement, reliable absorption, active oral agent and relief of obstruction.	Uncontrolled obstruction, renal/perinephric abscess, persistent instability or resistance.
Cellulitis	Improving local and systemic signs with suitable oral coverage.	Necrotizing infection, deep infection, undrained abscess or rapid progression.
Intra-abdominal infection	Adequate source control, improving status and oral coverage of relevant flora.	Ongoing leak, uncontrolled collection or peritonitis.
Bone/joint infection	Selected cases with susceptible pathogen, suitable oral agent and specialist plan.	Uncontrolled focus, limited oral options, complex hardware or poor adherence.
Gram-negative bacteraemia	Selected stable patients with controlled source and active oral option.	Persistent bacteraemia, endovascular focus, metastatic infection or instability.
S. aureus bacteraemia/endocarditis	Only selected protocol-defined situations with specialist oversight.	Do not apply routine switch criteria; assess for endocarditis and metastatic infection.
Meningitis/CNS infection	Only in unusual, specialist-defined circumstances.	Generally requires reliable CNS exposure and specialist-directed therapy.

7. EVIDENCE BASE AND INTERPRETATION

7.1 Evidence from randomized studies

Randomized evidence supports oral treatment or early conversion in selected clinical settings, but the strength and generalizability differ by infection. In severe community-acquired pneumonia, a multicentre randomized trial compared early conversion after three days of IV therapy with a longer IV course in non-ICU patients. Clinical cure and mortality were similar, while the early-switch strategy reduced IV treatment duration and length of stay [5]. Earlier randomized work also found that early conversion could be effective in appropriately selected pneumonia patients [7]. A separate study of patients with pneumococcal bacteraemia found that clinically stable patients could be switched safely when meningitis, endocarditis and other secondary foci were absent [11]. These studies support a stability-based approach rather than a fixed

minimum duration of parenteral therapy.

For bone and joint infection, the OVIVA trial was a large pragmatic randomized comparison of oral and IV treatment strategies in selected adults. Its findings challenge the assumption that prolonged IV administration is inherently superior for every deep musculoskeletal infection. Nevertheless, the trial depended on careful selection of oral regimens and specialist management. It should not be generalized to infections excluded from the study or to patients without an effective oral option [4].

7.2 Evidence from observational cohorts

Large observational studies describe real-world practice and help identify factors associated with switching. In a cohort of 4581 episodes of Gram-negative bloodstream infection across 24 hospitals, 43% of patients transitioned to oral antibiotics by day seven; the median transition occurred on day five among those switched. Patients maintained on IV therapy were more likely to have severe illness, ICU admission, fever or hypotension later in the course, immunosuppression and incomplete source control. These differences illustrate confounding by indication: clinicians are more likely to switch patients who are already improving.

Observational comparisons of outcomes must therefore be interpreted cautiously. A shorter length of stay in patients who switch may reflect the fact that they were clinically ready for discharge, rather than a causal effect of the oral route alone. Conversely, an association between delayed switching and poor outcomes may reflect ongoing illness severity. High-quality prospective studies should define eligibility before comparing treatment strategies and account for time-dependent clinical changes [9].

7.3 Guidelines and consensus criteria

Guidelines provide operational structure but differ in scope and certainty. The IDSA/SHEA stewardship guideline recommends programmes to improve appropriate oral antibiotic use and timely transition from IV to oral treatment [1]. The UK national IVOS criteria were developed through a multidisciplinary consensus process and provide a structured review framework for adults [2]. The 2025 IDSA complicated UTI guideline specifically addresses oral transition in clinically improving patients with an effective oral option and emphasizes the role of source control and adequate drug exposure. Local hospital protocols should translate these principles into practical review prompts while allowing exceptions for complex infections [8].

8. ANTIMICROBIAL STEWARDSHIP AND HOSPITAL IMPLEMENTATION

8.1 Daily antimicrobial review

Every patient receiving IV antibiotics should have a documented review of indication, spectrum, microbiology, dose, duration and route. A formal review within 24–48 hours is a useful minimum operational standard, with daily reassessment when IV therapy continues. The review should ask: Is infection still likely? Is the current agent active? Can the spectrum be narrowed? Is source control adequate? Can treatment be stopped? If treatment must continue, is oral therapy appropriate?

8.2 Multidisciplinary responsibility

Successful implementation requires collaboration between the prescribing team, nursing staff, pharmacists, microbiology laboratory and antimicrobial stewardship team. Nurses can identify return of oral intake, vomiting and line-related problems. Pharmacists can assess formulation, absorption, interactions, dose and medication access. Microbiology specialists can interpret susceptibility and advise on complex pathogens. Infectious diseases teams are particularly important for bacteraemia, endocarditis, prosthetic infections and resistant organisms.

8.3 Electronic prompts and audit

Electronic prescribing systems can flag patients who have received IV antibiotics for 24-48 hours and prompt documentation of a switch decision. Useful audit measures include the proportion of eligible patients switched, time from first IV dose to review, documentation of reasons for continued IV treatment, catheter complications, length of stay, readmission and treatment failure. Metrics should distinguish appropriate non-switching from missed opportunities; a high switch rate is not necessarily a marker of quality if patient selection is unsafe.

8.4 Discharge planning and continuity

An oral switch does not automatically mean that treatment is complete or that discharge is

appropriate. The intended total duration, oral dose, administration schedule, stop date, monitoring and follow-up should be documented. Patients should receive clear instructions about missed doses, adverse effects, interactions and when to seek medical attention. Medication availability and affordability should be confirmed before discharge. Where adherence is uncertain, the team should consider practical support rather than assuming that a prescription guarantees treatment completion [8].

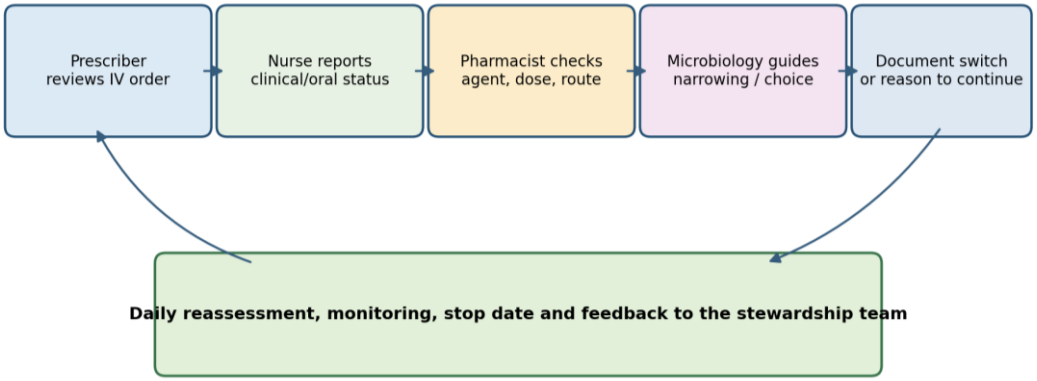

Figure: 2 Multidisciplinary hospital workflow for intravenous-to-oral antibiotic review and documentation.

9. BARRIERS, RISKS AND AREAS OF UNCERTAINTY

9.1 Clinician concern and therapeutic inertia

Some clinicians continue IV treatment because it is perceived as more potent or safer, even when an oral agent with adequate exposure is available. This belief may be reinforced by uncertainty about dose conversion, fear of relapse or lack of confidence in oral absorption. Education should emphasize that route alone does not determine efficacy; the relevant question is whether the selected regimen achieves adequate antimicrobial exposure at the site of infection.

9.2 Limited oral options and antimicrobial resistance

Resistance can leave few suitable oral agents, particularly for infections caused by multidrug-resistant Gram-negative organisms. An apparently active oral drug may not achieve sufficient bloodstream or tissue exposure, and susceptibility breakpoints should be interpreted in relation to dosing and infection site. In such cases, continued IV treatment or outpatient parenteral antimicrobial therapy may be appropriate.

9.3 Frailty, comorbidity and polypharmacy

Older adults and patients with renal impairment, swallowing difficulty, cognitive impairment or complex medication regimens may face additional barriers. Polypharmacy increases the likelihood of interactions, while poor appetite and gastrointestinal symptoms may compromise absorption. These factors should lead to individualized assessment and support, not automatic exclusion from oral therapy.

9.4 Risk of premature switching

Premature conversion can result in inadequate exposure, treatment failure or delayed recognition of an uncontrolled source. The risk is greatest when the diagnosis is uncertain, the patient remains unstable, microbiology is incomplete or the oral option is poorly matched to the pathogen. Clear documentation of the rationale, dose, duration and monitoring plan is essential. A low threshold for reassessment is appropriate if fever recurs, symptoms worsen or new organ dysfunction develops.

9.5 Unequal access and local context

Oral antibiotic availability, laboratory turnaround time, access to susceptibility testing and follow-up capacity vary across healthcare systems. In settings where patients may have difficulty obtaining medicines after discharge, the practical benefit of switching can be reduced unless access is secured. Hospital protocols should reflect local resistance patterns and available formulations rather than importing dosing tables without adaptation [8-10].

10. PRACTICAL RECOMMENDATIONS FOR HOSPITAL PRACTICE

An effective IVOS programme should be simple enough for routine use while preserving clinical judgment. The following operational recommendations synthesize the evidence and guidance reviewed in this article:

- Review every IV antibiotic prescription within 24–48 hours and document the indication and intended duration.
- Stop antibacterial treatment when bacterial infection is no longer supported; do not switch merely to complete an unnecessary course.
- Assess clinical trajectory, haemodynamic stability, oral intake, gastrointestinal absorption and source control together.
- Use microbiology results to narrow treatment and select the narrowest effective oral agent.
- Check oral bioavailability, pharmacodynamic target, tissue penetration, dose, renal/hepatic function, allergy and interactions.
- Use infection-specific guidance for pneumonia, urinary infection, skin infection, intra-abdominal infection and bloodstream infection.
- Seek specialist advice for endocarditis, S. aureus bacteraemia, CNS infection, prosthetic-device infection, persistent bacteraemia and complex bone or joint infection.
- Document the oral regimen, route, dose, frequency, total duration, stop date, monitoring and follow-up.
- Explain the treatment plan to the patient and confirm that medication can be obtained and taken as prescribed.
- Audit both appropriate switches and justified continuation of IV therapy; do not reward switching as an end in itself.

11. FUTURE PERSPECTIVES

Future work should refine infection-specific criteria and identify which patients benefit most from early oral conversion. Prospective studies should define eligibility at a common time point, report antimicrobial exposure and source control, and measure clinical failure, readmission, adverse events, patient experience and total healthcare cost. Greater attention is needed to infections caused by resistant organisms, immunocompromised populations and patients with complex comorbidities, who are often underrepresented in trials. Electronic clinical decision support may improve the reliability of review by linking antibiotic orders to vital signs, culture results, renal function and documented source control. Such tools should support rather than replace clinical judgment. Integration with antimicrobial stewardship dashboards could help identify missed review opportunities and compare practice across wards.

In addition, pharmacometric modelling and therapeutic drug monitoring may help optimize oral regimens in selected patients with altered physiology or difficult-to-treat pathogens. Research in lower-resource settings is also important. The potential advantages of oral conversion may be substantial where intravenous supplies, infusion capacity and hospital beds are constrained. However, safe implementation depends on dependable drug quality, access to susceptibility testing, locally relevant protocols and continuity of care after discharge. The most useful future strategy will combine evidence-based criteria with context-sensitive implementation.

12. CONCLUSION

Intravenous-to-oral antibiotic switching is an important component of high-quality hospital antimicrobial practice. It can reduce exposure to vascular access devices, improve comfort and mobility, release healthcare resources and support earlier discharge when the patient is otherwise ready. The decision must be based on the patient's clinical trajectory, physiological stability, gastrointestinal function, microbiological findings, source control and the pharmacological suitability of the oral agent. Evidence supports oral treatment in several common infections and selected complex infections, but the findings should not be generalized beyond the populations and protocols studied. A structured review within 24–48 hours, followed by daily reassessment, multidisciplinary involvement and clear documentation provides a practical framework. The objective is not to maximize the number of switches, but to ensure that every patient receives the most appropriate route of effective antimicrobial therapy for the current stage of illness.

13. DECLARATIONS

Conflict of interest

There is no known conflict of interest in this study.

Funding

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Ethical approval

Not applicable. This narrative study did not involve recruitment of human participants, collection of identifiable patient information or experimentation.

Data availability

Not applicable. No original dataset was generated for this narrative review.

Author contributions

All authors contributed to data collection and editing, designed the tables, and approved the final version for submission. The first author and the corresponding author's supervisor wrote the initial drafts of the manuscript.

Author contributions

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