

# Intravenous-to-oral conversion therapy for antimicrobials

ANTIMICROBIAL AGENTS ARE TYPICALLY RESPONSIBLE FOR 25 to 40% of the total medication costs in hospitals in North America (1,2) and are often the focus of cost containment efforts (3,4). Cost containment programs can be approached using several different methods, which are used by most institutions to varying degrees. Some of these methods include educational programs, use of a hospital formulary, selected sensitivity reporting from the microbiology laboratory, conversion programs, automatic stop orders and substitutions, antimicrobial treatment guidelines, controlled antimicrobials and control of in-hospital pharmaceutical company activities (1). Most of the reviews of cost containment programs have emphasized the need for improved education and, from a pragmatic standpoint, the efficacy of each method depends on whether it meets the needs of the practising clinician.

Conversion programs may be considered in the context of dosage, interval and route, or any combination thereof. Although conversions from higher to lower dosages and from shorter to longer intervals have been used for many years, early conversion from intravenous to oral therapy in the hospitalized patient has never received much emphasis. A formal conversion program from intravenous to oral, also referred to as 'switch' therapy (5), or 'step-down' therapy (6) is not novel, but if utilized to its full extent represents a unique and exciting opportunity to reduce costs significantly while improving the quality of patient care.

Although some clinicians are hesitant to initiate early transition to oral anti-infective therapy or to change the regimen of a patient who is demonstrating signs of improvement, there is increasing evidence to support the early use of oral agents in the treatment of several infectious diseases (4,7). Several studies have assessed the efficacy of oral antimicrobial therapy in various infections, including respiratory tract infections (8,9), skin and soft tissue infections (10,11), and bone and joint infections (12-14), and have provided considerable evidence to suggest that the use of oral agents is both safe and efficacious. For many years our pediatric colleagues have treated children with acute osteomyelitis with oral agents after an initial (usually

five to seven days) response to parenteral therapy, and gonococcal septic arthritis is often treated with oral therapy alone or after a brief course of parenteral therapy (15,16). The treatment of intra-abdominal infections or anaerobic brain abscesses (17) may be treated with oral as opposed to intravenous metronidazole. With the exception of patients with infections in areas into which antibiotic penetration is poor (ie, meningitis and infective endocarditis), the majority of hospitalized patients does not require prolonged courses of parenteral therapy.

Additional supporting evidence for the use of oral antimicrobials earlier in the course of treatment for infectious diseases may be found by a careful analysis of the pharmacokinetics of many antimicrobials. Several agents, including metronidazole, clindamycin, amoxicillin, trimethoprim-sulfamethoxazole, ciprofloxacin, ofloxacin, doxycycline and cephalexin, achieve high serum levels and excellent tissue penetration when given orally. The bioavailability of these agents suggests that they could be expected to achieve clinical results similar to intravenous preparations in patients with a normal absorptive capacity. Identification of patients for whom early conversion to oral therapy may be used must be individualized based on the patient's clinical status, lack of evidence suggesting malabsorption and ability to take medications orally. With the exception of endocarditis, meningitis and the initial treatment of the febrile neutropenic host, most patients may be considered for conversion therapy.

Several studies have considered the economic impact (6,8,18) of conversion therapy, and these investigations suggest that significant cost savings may be achieved through a reduction in direct acquisition costs, the absence of a need for special supplies required for intravenous medication, the decrease in related pharmacy and nursing labour and the ability to shorten length of stay. The relative ease of preparation, storage and administration of oral medications also makes this mode of administration more convenient as well as less expensive.

A pilot study at The Toronto Hospital suggests that at least 40% of antibiotic days are eligible for early



conversion to oral therapy (personal communication). A similar survey of patients at Mount Sinai Hospital in Toronto revealed that 40% of patients receiving a third-generation cephalosporin were eligible for oral therapy after 72 h of intravenous therapy (19). With an annual antibiotic expenditure of just under \$3 million at The Toronto Hospital, the implementation of an oral conversion program for only 12 antimicrobials results in an estimated crude cost savings of \$450,000 per year. Benefits to the patients also accrue, including the elimination of adverse events associated with intravenous therapy, increase of patient comfort and mobility if no intravenous therapy is required, and facilitation of a more active tangible role for the patient in his/her own treatment, not to mention the potential for early discharge. The implementation of a formalized early oral conversion program for hospitalized patients represents an ideal total quality management project and has a wide applicability for institutions across Canada. The potential for significant and meaningful cost savings in conjunction with improved quality of patient care on a national scale represents a unique opportunity that must not go unrecognized.

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