IV-to-Oral Antibiotic Conversion Using a Computerized Order Entry System: Rationale, Progress and Lessons Learned

Israel Lowy, MD Ph.D.1,2,4, AnnMarie Kесиer, RPh3,4, Umberto Conte, RPh3, Bernard Mehl, DPS3, Tom Karson, MD2,4, and Joseph Kannry, MD2,4;
Department of Medicine, Divisions of Infectious Diseases1, and Clinical Informatics2, Mount Sinai School of Medicine; Departments of Pharmacy3, and Information Technology4, Mount Sinai NYU Health Center, New York, NY.

Abstract: Timely conversion of IV to PO antibiotics can save $200K / year in pharmacy costs alone in an inpatient setting. An order entry system is an elegant platform to implement the conversion, educate providers, and quantitate the outcome. Alignment of stakeholders to support the initiative is as important as the informatics component to assure its success.

Introduction and Rationale: Many antibiotics have oral bioavailability that render them therapeutically equivalent to the intravenously dosed form. These are normally prescribed for courses of 7 to 10 days, and conversion to the oral form can result in significant savings in pharmacy costs. Moreover, prolonged IV infusions may delay discharge, increase the chances for IV site phlebitis and infection, complications that lead to further prolonged stay and increased morbidity. Thus, a rationale exists to encourage IV to oral conversion of antimicrobial agents (as well as other non-antimicrobial drugs).

Continued administration of IV, rather than oral forms of antibiotics occurs because of: lack of awareness of the therapeutic equivalence and the cost differential, unavailability of the enteral route (patient is NPO), or concern that the patient is too sick to rely upon adequate absorption by the oral route. After 24 to 48 hours these concerns are often allayed, but IV medications continue due to inertia and require additional effort to change. Efforts to promote IV to oral use generally require increased labor of dedicated personnel to review IV medications, and discussion with the provider is another addition to a busy day. Algorithms, e.g. care pathways for the management of community acquired pneumonia, involve clinical criteria that are rational, but whose implementation is also labor intensive. These efforts do not capture information on physician attitudes or provide for measurable educational feedback.

We hypothesized that our computer order entry system (TDS 7000) provided an opportunity to streamline this process, and that screening for orders of a targeted list of IV medications, and for diet orders permitting enteral intake (i.e., not strictly NPO), would capture all patients for whom an IV to PO conversion was possible. We further hypothesized that alerting physician prescribers at the next encounter with TDS for an identified patient would provide an opportunity to implement a conversion, assess resistance to change, and educate the prescriber. We would accurately demonstrate the cost savings in terms of pharmacy costs, decreased length of stay (LOS), and decreased complications.

Progress and Results: This plan was endorsed by an inter-institutional pharmacy subcommittee in the fall of 1999, convened for the integration between the hospitals systems merged into the Mount Sinai NYU Health System. Action on this proposal required alignment of various stakeholders in the process, as well as awaiting the reorganization of the institutional IT department. Concerns regarding programmability of TDS, its robustness to handle the additional decision support processes, as well as priorities involved in rolling out TDS to all inpatient units in the hospital also needed to be addressed. During this time the 1999 AMIA conference included a report by JM Teich, et al, describing the design and initial implementation of a similarly conceived program at the Brigham and Women’s Hospital in Boston.

A two week manual review by our pharmacy department of the usage of three antimicrobials targeted for IV to PO conversion (fluconazole, ciprofloxacin, levofloxacin) and the diet orders generated an estimate of potential savings of between $100,000 and $200,000 per year, in pharmacy costs alone (not including LOS or reduced complications). Programming of TDS to generate reports of patients with selected IV medications and permissible enteral intake has been accomplished. This allows a more precise measure of the pharmacy costs to be saved, as well as provides an estimate of potential reductions in LOS and complications. Programming of TDS to alert prescribers and collect information regarding attitudes is underway. This will allow a fully automated system to promote IV to PO conversion of these drugs. In the interim, manual review of the identified patients by the pharmacists and automatic conversion, subject to reversal by the prescribing physician, has been approved by the medical board as a cost saving measure.

Order entry systems can be employed to promote IV to PO conversion of antimicrobials, with the potential for large savings in pharmacy costs, decreased LOS and reduction in morbidity. This approach can be used for other medications that can be switched to oral form in a timely fashion.