

1: Arch Intern Med. 2004 Jun 14;164(11):1206-12.

[Related Articles, Links](#)

**Improving the process of antibiotic therapy in daily practice: interventions to optimize timing, dosage adjustment to renal function, and switch therapy.**

**Vogtlander NP, Van Kasteren ME, Natsch S, Kullberg BJ, Hekster YA, Van Der Meer JW.**

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**BACKGROUND:** Timely administration of the first dose, dosage adjustment to renal function, switch from intravenous to oral administration, and streamlining are important aspects of rational antibiotic prescription. The goals of this study were to investigate all of these variables, compare them with predefined quality standards, and implement improvement with specific interventions. **METHODS:** At the departments of internal medicine, surgery, and neurology and the emergency department of a tertiary referral university medical center, all consecutive patients receiving therapeutic antibiotics were enrolled. Dosages, timing of first doses, dosing intervals, administration routes, and adjustment of the chosen drug to clinical data were investigated. After the preintervention period, barriers to change were identified, followed by specific interventions and a postintervention measurement. **RESULTS:** In the preintervention and postintervention periods, 247 and 250 patients were enrolled, receiving 563 and 598 antibiotic prescriptions, respectively. The mean time from the order to first dose at the wards improved from 2.7 to 1.7 hours in potentially severe cases ( $P = .003$ ). Dosage adjustment to renal function remained unchanged at 45% vs 52% ( $P = .09$ ) of cases where necessary. Switching of therapy from intravenous to oral improved from 46% to 62% ( $P = .03$ ) and was performed a mean of 1.6 days earlier ( $P = .002$ ). Streamlining was performed correctly in most cases, and thus no interventions were necessary. **CONCLUSIONS:** Timing of antibiotic therapy and switch therapy may be improved with a combination of interventions. To improve poor adjustment of dosing to renal function, other strategies are needed. In our setting, streamlining was already correct in most cases.

PMID: 15197046 [PubMed - indexed for MEDLINE]

2: Clin Ther. 2004 Feb;26(2):294-303.

[Related Articles, Links](#)

**Evaluation of an algorithm for switching from IV to PO therapy in clinical practice in patients with community-acquired pneumonia.**

**van der Eerden MM, de Graaff CS, Vlaspolder F, Bronsveld W, Jansen HM, Boersma WG.**

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**BACKGROUND:** In patients with community-acquired pneumonia (CAP), switching from IV to PO antibiotics offers advantages over IV therapy alone, including improved cost-effectiveness through reductions in the length of hospital stay and treatment costs. **OBJECTIVE:** The aim of this study was to determine whether a method for switching therapy in clinical practice could be used in patients with CAP and whether differences were found in the duration of IV treatment and length of hospital stay between the 5 risk classes of the Pneumonia Severity Index (PSI) after the therapy switch. **METHODS:** This was a prospective, observational study of patients aged  $\geq 18$  years presenting with CAP at our teaching hospital between December 1998 and November 2000. Microbiological and serological tests were performed, and signs and symptoms of CAP, C-reactive protein levels, and white blood cell counts were assessed throughout treatment and at the 1-month follow-up. Patients were stratified by PSI risk class. When the patient's temperature had been normalized for 72 hours and respiratory symptoms (dyspnea, coughing, and thoracic pain) had improved, patients were switched from IV to PO therapy (same drug). **RESULTS:** The study included 180 patients with CAP. Clinical cure was seen in 174 (97%) patients. No significant difference between the 5 risk classes was found in duration of therapy. Patients in risk class V remained hospitalized for a significantly longer period than patients in risk classes I through IV ( $P < 0.001$ ). Furthermore, after patients were switched to PO antibiotics, the level of C-reactive protein decreased in patients in all risk classes and was normalized by follow-up. **CONCLUSIONS:** In the population studied, use of specific criteria (ie, absence of fever for 72 hours and reduction in respiratory symptoms) allowed successful switch from IV to PO antibiotic therapy for the treatment of CAP. Duration of therapy was not affected by PSI risk class, but those in risk class V were hospitalized longer than other risk classes.

PMID: 15038952 [PubMed - indexed for MEDLINE]

3: Med Arh. 2003;57(5-6):263-6.

[Related Articles, Links](#)

**[Analysis of amoxicillin-clavulanic acid (Xiclav) efficacy and the possibility of early switch from parenteral to oral therapy in the treatment of infections]**

[Article in Bosnian]

**Ahmetagic S, Jusufovic E, Cengic D, Koluder N, Bajramovic N, Calkic L, Hadzic E, Salaka U, Sijercic M.**

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Early transition from parenteral to oral antibiotic therapy switch therapy play a major role in treatment because of adverse reactions of long parenteral therapy. In the prospective, comparative and randomized clinical study the efficacy of two treatment regimens were analyzed: XICLAV (amoxicillin + clavulanic acid): parenteral regimen with early transition to oral therapy and parenteral regimen in patients with bacterial infections without transition to the oral dosage form, on the other hand. In our study we've analyzed 240 hospitalized patients in the Clinic of infectious Diseases in Tuzla and Sarajevo too, so in the Institution for infectious diseases in Zenica. The mean age of our patients was 39.6 years, 70.8% females. The major (50.5%) patients had urinary or respiratory tract infectious (bacterial pneumonia 38.8%) but several patients have had skin infections and sepsis. The first 120 patients were initially treated by Xiclav administered parenterally i.v. (adults at a dose of 3 x 1.2 gr i.v.; the children at a dose of 3 x 30 mg/kg) with early oral switch therapy (adults at a dose of 3 x 625 mg per os; the children at a dose of 3 x 25-50 mg/kg); whereas the others (120 patients) were treated parenterally by the regimen mentioned above. The mean length of i.v. therapy and hospitalization in the i.v. group was

4.12/10.21 days respectively ( $p > 0.05$ ). The clinical efficacy switch of both therapeutic regimens was comparable. The resolution of all clinical symptoms and laboratory signs of infections was noted at 69% patients of both groups, with significant improvements at 21% patients and at 10% patients showed clinical failure. The tolerability of Xiclav was very good. The adverse reactions during treatment were observed at 5.2% patients. This study noticed satisfied clinical and bacterial efficacy so did tolerability of Xiclav in the treatment of bacteriological infections. Xiclav apply early transition from parenteral to oral therapy.

Publication Types:

- Clinical Trial
- Randomized Controlled Trial

PMID: 15022575 [PubMed - indexed for MEDLINE]

4: Ned Tijdschr Geneeskd. 2004 Jan 31;148(5):222-6.

[Related Articles, Links](#)

#### [Preventing prolonged antibiotic therapy by active implementation of switch guidelines]

[Article in Dutch]

**Handoko KB, van Asselt GJ, Overdiek JW.**

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**OBJECTIVE:** To reduce the number of days of unnecessary intravenous antibiotic therapy via an early switch to oral antibiotic therapy. **DESIGN:** Prospective, open trial. **METHODS:** A guideline was drawn up for an early and yet safe switch from intravenous to oral antibiotic therapy. Patients on the wards of Internal Medicine, Pulmonology, Surgery and Orthopaedics of the Haaglanden Medical Centre in The Hague, the Netherlands, were followed for four months. A zero measurement at two months was followed by an intervention period of two months. The number of unnecessary days of intravenous antibiotic therapy was taken as the measure of effectiveness. A multidisciplinary team carried out the interventions, consisting of educational, supportive and guiding measures. Making progress measurable and giving feedback played an important role during the intervention. **RESULTS:** During the zero-measurement period on the Internal Medicine and Pulmonology wards, 26% (9/35) of patients were switched within the timeframe predefined by the guideline. The average number of unnecessary i.v. days was 2.4 (median: 2). During the intervention period, 84% (64/76) were switched within the predefined timeframe, with an average of 0.2 unnecessary i.v. days per patient (median: 0). There was thus a significantly lower number of unnecessary i.v. days after intervention (difference: 2.2; 95%-CI: 1.5-3.0). On the surgical and orthopaedic wards, 9% (2/22) of patients were switched within the predefined timeframe during the zero-measurement period, with an average of 7.3 unnecessary i.v. days (median: 5). During the intervention period, 52% of patients (17/33) were switched within the predefined timeframe, for an average of 1.1 unnecessary i.v. days (median: 0). The reduction in the number of unnecessary i.v. days was also significant here (difference: 6.2; 95%-CI: 2.9-9.5). **CONCLUSION:** A significant reduction in the number of unnecessary days of intravenous antibiotic therapy was obtained via simple interventions carried out by a multidisciplinary team.

Publication Types:

- Clinical Trial

PMID: 14983578 [PubMed - indexed for MEDLINE]

5: Clin Ther. 2003 Dec;25(12):3173-89.

[Related Articles, Links](#)

#### **Cost analysis of switching from i.v. vancomycin to p.o. linezolid for the management of methicillin-resistant Staphylococcus species.**

**McCullum M, Rhew DC, Parodi S.**

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**BACKGROUND:** Infections with methicillin-resistant Staphylococcus species (MRSS) are associated with higher treatment costs than infections with methicillin-sensitive Staphylococcus species in the United States--partly because of an increased length of hospital stay (LOS). **OBJECTIVE:** This study used pharmacoeconomic modeling to evaluate the costs and outcomes associated with the use of i.v. vancomycin compared with p.o. linezolid in the treatment of MRSS-infected patients. **METHODS:** A retrospective chart review was used to determine the number of cases with confirmed or presumed MRSS infections treated with i.v. vancomycin during calendar-year 2000 at the Veterans Affairs Greater Los Angeles Healthcare System inpatient facility. Patients who were eligible for a switch to p.o. linezolid with or without early discharge to home were identified. Cost differences associated with conversion from i.v. to p.o. therapy (compared with continued i.v. therapy) were estimated based on a mean decreased LOS and a decrease in the costs associated with catheter-related adverse events. Rates and costs of catheter-related adverse events were based on estimates from the literature. Sensitivity analyses were performed by variation of the estimated mean LOS decrease in the SD and by variation of the estimates for incidence and costs related to catheter complications. Costs were measured in year 2000 US dollars, and differences were not assessed for statistical significance. **RESULTS:** Of 177 patients treated with i.v. vancomycin, 103 (58%) were eligible for conversion to p.o. linezolid and 55 (31%) were eligible for early discharge from the hospital with continuation of p.o. therapy. Early discharge was associated with a mean (SD) LOS decrease of 3.3 (2.9) days. Annual mean total cost savings in patients eligible for conversion from i.v. vancomycin to p.o. linezolid with early discharge were \$294,750 (range, \$35,730-\$553,790). For cases eligible for inpatient conversion from i.v. vancomycin to p.o. linezolid therapy (n=48), the mean total annual cost difference was an increase of \$6340 for p.o. linezolid (range, -\$12,910 to \$11,900). **CONCLUSION:** These results--although partly based on estimates from the literature, rather than direct measurements--support the use of p.o. linezolid with or without early discharge as a potential cost-savings alternative for eligible patients treated with a full course of i.v. vancomycin for suspected or

confirmed MRSS infection.

PMID: 14749155 [PubMed - indexed for MEDLINE]

6: Am J Respir Med. 2003;2(5):385-94.

[Related Articles, Links](#)

**Management of community-acquired pneumonia: a focus on conversion from hospital to the ambulatory setting.**

**Tan JS, File TM Jr.**

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Patients with community-acquired pneumonia (CAP) are treated in hospital or in the ambulatory care setting depending on the severity of illness. Despite numerous guidelines proposed, there is no agreement on specific criteria for hospitalization other than the clinicians' experience. The purpose of this review is to discuss the importance of the appropriate choice and timely administration of antibacterial agents, either in the hospital or in the outpatient setting. Since a high proportion of CAP patients will not have an etiologic agent identified at the time of initiation of treatment, the choice of antibacterial therapy is usually empiric. Antibacterial agents with activity against pneumococci and atypical pathogens causing pneumonia are the preferred choices. Macrolides, doxycycline, or respiratory fluoroquinolones have been recommended by various guidelines committees in North America for the treatment of pneumonia in patients with or without underlying comorbidities. Because of the increasing resistance to beta-lactams as well other antibacterial agents such as macrolides, doxycycline, and sulfamethoxazole/trimethoprim (cotrimoxazole), it is important that clinicians are aware of local statistics on resistance to *Streptococcus pneumoniae*, as infection with this bacterium is associated with high rates of morbidity and mortality. More recently, fluoroquinolone resistance has been reported, but the percentage of pneumococcal strains resistant to this agent is relatively low compared with the other antibacterial agents. Switch (intravenous to oral) therapy is recommended for hospitalized patients with CAP to facilitate early discharge, which has been shown to improve patient satisfaction and reduce hospital costs. Early conversion to oral therapy has not been shown to be associated with increased complications or higher mortality. Following prompt intravenous therapy and stabilization, patients with CAP should be treated with oral therapy in the ambulatory setting.

Publication Types:

- Review
- Review, Tutorial

PMID: 14719991 [PubMed - indexed for MEDLINE]

7: Arch Intern Med. 2003 Nov 24;163(21):2585-9.

[Related Articles, Links](#)

**Conversion from intravenous to oral medications: assessment of a computerized intervention for hospitalized patients.**

**Fischer MA, Solomon DH, Teich JM, Avorn J.**

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**BACKGROUND:** Many hospitalized patients continue to receive intravenous medications longer than necessary. Earlier conversion from the intravenous to the oral route could increase patient safety and comfort, reduce costs, and facilitate earlier discharge from the hospital without compromising clinical care. We examined the effect of a computer-based intervention to prompt physicians to switch appropriate patients from intravenous to oral medications. **METHODS:** This study was performed at Brigham and Women's Hospital, an academic tertiary care hospital at which all medications are ordered online. We targeted 5 medications with equal oral and intravenous bioavailability: fluconazole, levofloxacin, metronidazole, ranitidine, and amiodarone. We used the hospital's computerized order entry system to prompt physicians to convert appropriate intravenous medications to the oral route. We measured the total use of the targeted medications via each route in the 4 months before and after the implementation of the intervention. We also measured the rate at which physicians responded to the intervention when prompted. **RESULTS:** The average intravenous defined daily dose declined by 11.1% ( $P = .002$ ) from the preintervention to the postintervention period, while the average oral defined daily dose increased by 3.7% ( $P = .002$ ). Length of stay, case-mix index, and total drug use at the hospital increased during the study period. The average total monthly use of the intravenous preparation of all of the targeted medications declined in the 4 months after the intervention began, compared with the 4 months before. In 35.6% of 1045 orders for which a prompt was generated, the physician either made a conversion from the intravenous to the oral version or canceled the order altogether. **CONCLUSIONS:** Computer-generated reminders can produce a substantial reduction in excessive use of targeted intravenous medications. As online prescribing becomes more common, this approach can be used to reduce excess use of intravenous medications, with potential benefits in patient comfort, safety, and cost.

PMID: 14638558 [PubMed - indexed for MEDLINE]

8: J Manag Care Pharm. 2003 Jul-Aug;9(4):317-26.

[Related Articles, Links](#)

**Early switch and early discharge opportunities in intravenous vancomycin treatment of suspected methicillin-resistant staphylococcal species infections.**

**Parodi S, Rhew DC, Goetz MB.**

**BACKGROUND:** Patients with methicillin-resistant *Staphylococcus aureus* (MRSA) and methicillin-resistant coagulase negative staphylococci (MR-CoNS) infections are usually treated with intravenous (IV) vancomycin and remain hospitalized for the duration of IV therapy. Oral linezolid has excellent bioavailability and activity against MRSA and MR-CoNS and offers the potential for outpatient treatment of MRSA and MR-CoNS infections. **OBJECTIVE:** To determine the potential for early switch (ES) from IV vancomycin to oral linezolid and subsequent early discharge (ED) in hospitalized, adult patients treated for an MRSA or MR-CoNS infection. **METHODS:** We conducted a retrospective cohort study at the Veterans Administration Greater Los Angeles Healthcare System from January 1 through December 31, 2000. Potential reductions in vancomycin use, hospital length of stay (LOS), and economic savings were determined. **RESULTS:** A total of 103 of 177 (58%) treatment courses for MRSA or MR-CoNS infections were potentially eligible for ES, with annual and mean decreases in vancomycin use of 535 defined daily doses and 5.2 days per event. Of the ES cohort, 55 of 103 (53%) courses were potentially eligible for ED, with an annual and mean reduction in LOS of 181 days and 3.3 days per event. The total potential savings was \$220,181, at an average of \$3,478 per event. **CONCLUSION:** Early switch to oral linezolid for treatment of MRSA or MR-CoNS infections could reduce vancomycin use, hospital length of stay, and economic costs. **KEYWORDS:** Oxazolidanone, Vancomycin, Length of stay, Methicillin resistance, Staphylococcal infections

PMID: 14613450 [PubMed - indexed for MEDLINE]

9: Nihon Kokyuki Gakkai Zasshi. 2003 Apr;41(4):261-7.

[Related Articles, Links](#)

### [The efficacy of switch therapy in community-acquired pneumonia in Japan]

[Article in Japanese]

**Uchiyama N, Aoshima M, Satoh T, Chonabayashi N.**

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To evaluate the efficacy of Switch therapy for community-acquired pneumonia, we conducted a prospective randomized controlled study in thirty-two hospitalized patients. These cases corresponded to Fine's risk classes II to IV. Using a table of random numbers, sixteen patients were assigned to a Switch therapy group, and the other sixteen, to a clinical pathway group. Both groups initially received intravenous antimicrobials. Within the Switch therapy group, when all the patients were afebrile for more than sixteen hours, their intravenous antimicrobials were switched to oral, and the patients were discharged on the following day. For all patients in the clinical pathway group, the critical pathway was defined as an eight-day planned hospitalization, with a time-task matrix formatted for disease treatment, laboratory testing, physical examination, oxygen saturation monitoring, ambulation, diet, patient education and clinical outcome. Switch therapy reduced the period of intravenous antimicrobial administration from 7.6 days to 4.0 days ( $p < 0.0001$ ). The period required to switch to oral antimicrobials decreased from 8.3 days to 4.8 days ( $p < 0.0001$ ); hospital stay length, from 9.8 days to 6.5 days ( $p = 0.0001$ ); and medical resource utilization, from 330, 373 to 227,768 Japanese yen ( $p = 0.0002$ ). No patient from either group required readmission. In conclusion, Switch therapy was more efficient than management with a clinical pathway for mild to moderate community-acquired pneumonia in hospitalized patients.

Publication Types:

- Clinical Trial
- Randomized Controlled Trial

PMID: 12795180 [PubMed - indexed for MEDLINE]

10: Drugs Today (Barc). 2001 May;37(5):311-319.

[Related Articles, Links](#)

### Intravenous to oral antibiotic switch therapy.

**Cunha BA.**

Chief, Infectious Disease Division, Winthrop-University Hospital, Mineola, New York and Professor of Medicine, State University of New York School of Medicine, Stony Brook, New York, USA.

I.v.-to-p.o. switch therapy has become the mainstay of antibiotic therapy for the majority of patients. I.v.-to-p.o. switch therapy is inappropriate for critically ill patients who require i.v. antibiotic therapy and should not be considered in patients who have the inability to absorb drugs. These exceptions constitute a very small percentage of hospitalized patients for which i.v.-to-p.o. switch therapy is ideal. I.v.-to-p.o. switch therapy is best achieved with antibiotics that have high bioavailability that result in the same blood and tissue concentrations of antibiotic as their intravenous counterpart and have few gastrointestinal side effects. Antibiotics ideal for i.v.-to-p.o. switch programs include chloramphenicol, clindamycin, metronidazole, TMP-SMX, fluconazole, itraconazole, voriconazole, doxycycline, minocycline, levofloxacin, gatifloxacin, moxifloxacin and linezolid. Antibiotics that may be used in i.v.-to-p.o. switch programs that have lower bioavailability but are effective include beta-lactams and macrolides. For antibiotics with no oral formulation, e.g., carbapenems, equivalent coverage must be provided with an oral antibiotic from an unrelated class. Excluding gastrointestinal malabsorptive disorders, disease state is not a determinant of suitability for i.v.-to-p.o. switch programs. I.v.-to-p.o. switch programs should be used in patients with any infectious disease disorder for which there is effective oral therapy and is not limited to certain infectious diseases. Oral absorption of antibiotics is near normal in all but the most critically ill patients. Therefore, even in sick, hospitalized individuals, p.o. therapy is appropriate. I.v.-to-p.o. switch therapy has several important advantages including decreasing drug cost (i.v. vs. p.o.), decreasing length of stay permitting earlier discharge and optimal reimbursement and decreasing or eliminating i.v. line phlebitis and sepsis with its cost implications. Clinicians should consider all patients, except the most critically ill or those unable to absorb oral medications, as candidates for treatment for most or all of their antibiotic treatment with oral antibiotics. (c) 2001 Prous Science. All rights reserved.

PMID: 12768219 [PubMed - as supplied by publisher]

11: Adv Ther. 2002 Sep-Oct;19(5):229-42.

[Related Articles, Links](#)

**IV-to-oral switch therapy for community-acquired pneumonia requiring hospitalization: focus on gatifloxacin.**

**Pelly L.**

The majority of the 1.1 million patients hospitalized for community-acquired pneumonia (CAP) in the United States begin therapy with an intravenous antibiotic. A switch to oral therapy as soon as patients are clinically stable reduces the length of hospitalization and associated costs. Fluoroquinolones are appropriate candidates for switch therapy. Gatifloxacin is an excellent choice when a fluoroquinolone is being considered for sequential switch therapy in the treatment of CAP requiring hospitalization.

Publication Types:

- Review
- Review, Academic

PMID: 12539883 [PubMed - indexed for MEDLINE]

12: Pharm World Sci. 2002 Dec;24(6):247-55.

[Related Articles, Links](#)

**Intravenous and oral antibiotics in respiratory tract infection: an international observational study of hospital practice.**

**Cooke J, Kubin M, Morris T, Ribas J, Kramer I, Kammerer W, Fornaini R, Ballet AC, Sagnier PP.**

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**BACKGROUND:** Hospitalised patients with respiratory tract infections (RTI) frequently receive intravenous (i.v.) antibiotics followed by a short course of oral treatment. **OBJECTIVES:** To observe antibiotic use in hospitals in Germany, Spain, France, Italy and the UK and the reasons for choosing the i.v. route and switching to oral treatment. **METHODS:** Research pharmacists sought the opinions of physicians and senior nurses in the completion of a semi-structured questionnaire on the treatment of RTI with i.v. antibiotics. Questions focussed on antimicrobials of choice, reasons for choosing i.v., reasons for changing to oral administration, and duration of treatment. **RESULTS:** This study recruited 796 patients with RTI, usually pneumonia. Prescribing patterns varied widely between the five hospitals. Accepted clinical criteria were only commonly cited in Germany, Spain and the UK as reasons for choosing the i.v. route at the beginning of the study. These were more commonly cited at the time of switch, although other criteria such as improved condition, were other significant reasons. The mean duration of i.v. treatment ranged from 4 days in the UK to 10 days in Italy, where most patients received the full course of treatment by the i.v. route. Unlike the other hospitals studied, the few patients in Italy who were switched to another form of treatment were as likely to receive intramuscular as oral administration (13% and 11%, respectively). **CONCLUSIONS:** The practice of and reasons for prescribing i.v. antibiotics varied in the hospitals studied. Objective clinical criteria were inconsistently cited as reasons for administering i.v. antibiotics and in general these reasons were unrelated to those given for the switch from i.v. to oral administration. In order for guidelines for switching from i.v. to oral antimicrobials to be routinely employed, explicit physiological criteria need to be recorded in a routine fashion. Closer co-operation between pharmacists and physicians may help in developing and implementing guidelines at a local level.

Publication Types:

- Multicenter Study

PMID: 12512158 [PubMed - indexed for MEDLINE]

13: J Antimicrob Chemother. 2003 Jan;51(1):101-6.

[Related Articles, Links](#)

**Pharmacokinetic aspects of levofloxacin 500 mg once daily during sequential intravenous/oral therapy in patients with lower respiratory tract infections.**

**Furlanut M, Brollo L, Lugatti E, Di Qual E, Dolcet F, Talmassons G, Pea F.**

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Levofloxacin is considered an effective antibiotic in the treatment of community-acquired lower respiratory tract infections (LRTIs). A study was carried out on 17 in-patients to assess the pharmacokinetics of a 500 mg once-daily switch intravenous (i.v.)/oral regimen of levofloxacin in the treatment of LRTI patients. Blood samples were collected under steady-state conditions at appropriate intervals. Levofloxacin plasma concentrations were analysed by means of HPLC and pharmacokinetic parameters were estimated using the WinNonlin pharmacokinetic software package. A lower clearance of levofloxacin (<2 mL/min/kg), conditioning both a longer elimination half-life (approximately 9 h) and a larger AUC(0-tau) (approximately 80 mg/L x h), was observed for both routes in our patients than in healthy volunteers. These differences may be explained considering that levofloxacin is excreted mainly as unchanged drug by the renal route, and most of our patients (71%) were very elderly subjects whose renal function physiologically declines with age. The almost complete (> or =99%) absolute oral bioavailability suggests that a comparable

exposure to the iv regimen may be achieved after oral administration. The overall clinical success rate was 94.1%.

PMID: 12493793 [PubMed - indexed for MEDLINE]

14: Chest. 2002 Oct;122(4):1271-9.

[Related Articles, Links](#)

**Cost-effectiveness of IV-to-oral switch therapy: azithromycin vs cefuroxime with or without erythromycin for the treatment of community-acquired pneumonia.**

**Paladino JA, Gudgel LD, Forrest A, Niederman MS.**

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**STUDY OBJECTIVE:** To conduct a cost-effectiveness analysis of IV-to-oral regimens of azithromycin vs cefuroxime with or without erythromycin in the treatment of patients hospitalized with community-acquired pneumonia (CAP). **PATIENTS:** Of the 268 evaluable patients enrolled into a randomized, multicenter clinical trial of adults, 266 patients had sufficient data to be included in this cost-effectiveness analysis. One hundred thirty-six patients received azithromycin, and 130 patients received cefuroxime with or without erythromycin. **METHODS:** A pharmacoeconomic analysis from the hospital provider perspective was conducted. Health-care resource utilization was extracted from the clinical database and converted to national reference costs. Decision analysis was used to structure and characterize outcomes. Sensitivity analyses were performed, and statistics were applied to the cost-effectiveness ratios. **RESULTS:** The clinical success and adverse event rates and antibiotic-related length of stay were 78%, 11.8%, and 5.8 days for the azithromycin group and 75%, 20.7%, and 6.4 days for the group receiving cefuroxime with or without erythromycin, respectively. Geometric mean treatment costs were 4,104 US dollars (95% confidence interval [CI], 3,874 to 4,334 US dollars) for the azithromycin group, and 4,578 US dollars (95% CI, 4,319 to 4,837 US dollars) for the group receiving cefuroxime with or without erythromycin ( $p = 0.06$ ). The cost-effectiveness ratios were 5,265 US dollars per expected cure for the azithromycin group, and 6,145 US dollars per expected cure for group receiving cefuroxime with or without erythromycin ( $p = 0.05$ ). **CONCLUSIONS:** Despite a higher per-dose purchase price, overall costs with azithromycin tended to be lower due to decreased duration of therapy, lower preparation and administration costs, and reduced hospital length of stay. As empiric therapy, azithromycin monotherapy was cost-effective compared to cefuroxime with or without erythromycin for patients hospitalized with CAP who have no underlying cardiopulmonary disease, and no risk factors for either drug-resistant pneumococci or enteric Gram-negative pathogens.

Publication Types:

- Clinical Trial
- Multicenter Study
- Randomized Controlled Trial

PMID: 12377852 [PubMed - indexed for MEDLINE]

15: Crit Care Med. 2002 Jun;30(6 Suppl):S356-61.

[Related Articles, Links](#)

**Pharmacology of acid suppression in the hospital setting: focus on proton pump inhibition.**

**Pisegna JR.**

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The more potent and longer-lasting inhibition of gastric acid secretion provided by proton pump inhibitors (PPIs) as compared with histamine-2-receptor antagonists is caused in large part by differences in their mechanism of action. PPIs block histamine-2-, gastrin-, and cholinergic-mediated sources of acid production and inhibit gastric secretion at the final common pathway of the H<sup>+</sup>/K<sup>+</sup> adenosine triphosphatase proton pump. In contrast, histamine-2-receptor antagonists cannot block receptor sites other than those mediated by histamine. It seems that the rapid loss of acid suppression activity by the histamine-2-receptor antagonists may be attributed to tolerance. Such tolerance has not occurred in patients receiving PPIs because these agents are irreversible inhibitors of the H<sup>+</sup>/K<sup>+</sup> adenosine triphosphatase proton pump. For these reasons, patients who have acid-related disorders that require high levels of acid suppression do not respond well to intravenous histamine-2-receptor antagonists and would be excellent candidates for intravenous PPI therapy. Candidates for intravenous PPIs also include patients who cannot receive oral PPIs and those who may need the higher acid suppression therapy provided by the intravenous rather than the oral route. Clinical studies have demonstrated the efficacy of intravenous pantoprazole in maintaining adequate control of gastric acid output during the switch from oral to intravenous therapy in patients with severe gastroesophageal reflux disease or the Zollinger-Ellison syndrome. Intra-gastric administration of solutions prepared from oral PPIs has been used as an alternative to the intravenous route in critical care settings. However, decreased bioavailability may limit the value of intra-gastric delivery of PPIs because of the high frequency of gastric emptying problems in critically ill patients.

Publication Types:

- Review
- Review, Tutorial

PMID: 12072661 [PubMed - indexed for MEDLINE]

16: Curr Opin Infect Dis. 2001 Aug;14(4):415-22.

**Risk assessment and risk-based therapeutic strategies in febrile neutropenia.**

**Kern WV.**

Department of Medicine, University Hospital and Medical Center, Ulm, Germany.

Different approaches have developed over time regarding the empirical antimicrobial therapy of fever in neutropenic patients. The use of intravenous antibiotics remains the standard approach. Clinical criteria and 'low-risk' prediction rules have been developed that help select patients in whom oral therapy is well tolerated and who may be eligible for outpatient management. Comorbidity and clinical status at presentation remain important criteria in the risk-assessment process. Outpatient management requires additional assessment of non-medical criteria. Patients without documented infection and who have responded to initial therapy may benefit from simplified therapy such as a switch to oral drugs and/or outpatient management. Discontinuation of therapy may be considered in selected cases. Risk assessment in neutropenic patients with persistent unexplained fever is challenging. Available data suggest that broadening of the antibacterial coverage is of limited value. Instead, definition of the risk of fungal infection by using clinical criteria, imaging and laboratory studies, as well as the identification of those patients likely to benefit from antifungal therapy, appear to be of critical importance.

Publication Types:

- Review
- Review, Tutorial

PMID: 11964858 [PubMed - indexed for MEDLINE]

17: Curr Opin Infect Dis. 2000 Dec;13(6):599-607.

**Sequential antibiotic therapy.**

**Barlow GD, Nathwani D.**

Infection & Immunodeficiency Unit, Kings Cross Hospital, Tayside University Teaching Hospitals, Dundee, UK.

Antimicrobials are an important source of hospital expenditure. Traditionally, severe bacterial infections have been treated initially with intravenous antibiotics, followed by physician-directed switch to oral therapy. Unfortunately this approach results in unnecessary prolongation of intravenous treatment, with all its inherent disadvantages. Sequential antibiotic therapy, however, ensures an early switch to the oral route when the patient is clinically stable. This increasingly employed strategy is safe and results in improved quality and cost-effectiveness of health care. To ensure timely and appropriate switch, such programmes need to be underpinned by clear guidelines and supported by a multidisciplinary team. In the future, key questions, such as what is the optimal time of switch for specific infections, and can conditions such as osteomyelitis and endocarditis be efficaciously treated with oral therapy, need to be answered. Only then will clinicians be able to practise evidence-based infection management incorporating sequential antimicrobial therapy.

PMID: 11964828 [PubMed - as supplied by publisher]

18: Am J Med. 2001 Oct 1;111(5):412-3.

Comment on:

- [Am J Med. 2001 Oct 1;111\(5\):367-74.](#)

**Oral or intravenous-to-oral antibiotic switch therapy for treating patients with community-acquired pneumonia.**

**Cunha BA.**

Publication Types:

- Comment
- Editorial

PMID: 11583649 [PubMed - indexed for MEDLINE]

19: J Gen Intern Med. 2001 Sep;16(9):599-605.

Comment in:

- [J Gen Intern Med. 2001 Sep;16\(9\):642-3.](#)

## What factors influence physicians' decisions to switch from intravenous to oral antibiotics for community-acquired pneumonia?

Halm EA, Switzer GE, Mittman BS, Walsh MB, Chang CC, Fine MJ.

Departments of Health Policy and Medicine, Mount Sinai School of Medicine, New York, NY 10029, USA. ethan.halm@mountsinai.org

**OBJECTIVE:** One of the major factors influencing length of stay for patients with community-acquired pneumonia is the timing of conversion from intravenous to oral antibiotics. We measured physician attitudes and beliefs about the antibiotic switch decision and assessed physician characteristics associated with practice beliefs. **DESIGN:** Written survey assessing attitudes about the antibiotic conversion decision. **SETTING:** Seven teaching and non-teaching hospitals in Pittsburgh, Pa. **PARTICIPANTS:** Three hundred forty-five generalist and specialist attending physicians who manage pneumonia in 7 hospitals. **MEASUREMENTS AND RESULTS:** Factors rated as "very important" to the antibiotic conversion decision were: absence of suppurative infection (93%), ability to maintain oral intake (79%), respiratory rate at baseline (64%), no positive blood cultures (63%), normal temperature (62%), oxygenation at baseline (55%), and mental status at baseline (50%). The median thresholds at which physicians believed a typical patient could be converted to oral therapy were: temperature  $\leq 100$  degrees F (37.8 degrees C), respiratory rate  $\leq 20$  breaths/minute, heart rate  $\leq 100$  beats/minute, systolic blood pressure  $\geq 100$  mm Hg, and room air oxygen saturation  $\geq 90\%$ . Fifty-eight percent of physicians felt that "patients should be afebrile for 24 hours before conversion to oral antibiotics," and 19% said, "patients should receive a standard duration of intravenous antibiotics." In univariate analyses, pulmonary and infectious diseases physicians were the most predisposed towards early conversion to oral antibiotics, and other medical specialists were the least predisposed, with generalists being intermediate ( $P < .019$ ). In multivariate analyses, practice beliefs were associated with age, inpatient care activities, attitudes about guidelines, and agreeableness on a personality inventory scale. **CONCLUSIONS:** Physicians believed that patients could be switched to oral antibiotics once vital signs and mental status had stabilized and oral intake was possible. However, there was considerable variation in several antibiotic practice beliefs. Guidelines and pathways to streamline antibiotic therapy should include educational strategies to address some of these differences in attitudes.

PMID: 11556940 [PubMed - indexed for MEDLINE]

20: J Hosp Infect. 2001 Aug;48(4):249-57.

[Related Articles, Links](#)

### Sequential antibiotic therapy for cost containment in the hospital setting: why not?

Lelekis M, Gould IM.

Special Infections Unit, The General Hospital of Athens "G. Gennimatas", Greece.

Antibiotic cost represents a significant part of hospital budgets all over the world. Restriction policies, however and other similar programmes intervening in antimicrobial prescribing have not always been successful in lowering antibiotic expenditure. Timely switch or sequential therapy from initial intravenous to subsequent equivalent oral treatment has been implemented in many institutions for the same purpose. Using strict criteria for optimum patient selection, switch therapy has been proven both effective as antimicrobial treatment and cost saving. As healthcare resources remain lower than needed, cost-saving policies become very desirable. Thus, switch therapy is expected to be more widely used, since it is a cost containing policy which does not compromise treatment outcome. Copyright 2001 The Hospital Infection Society.

Publication Types:

- Review
- Review, Tutorial

PMID: 11461124 [PubMed - indexed for MEDLINE]

Items 21 - 40 of 61

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21: Pharmacotherapy. 2001 Jul;21(7 Pt 2):83S-88S.

[Related Articles, Links](#)

### Intravenous-to-oral transition therapy in community-acquired pneumonia: the INOVA Health System experience.

Milkovich G.

INOVA Health System, Falls Church, Virginia, USA.

Economic pressures on the delivery of health care have necessitated a focus on reducing costs and resource utilization while maintaining or improving the quality of care. A growing consensus holds that switching from intravenous to oral therapy is a cost-effective and clinically sound approach for a significantly large group of patients with community-acquired pneumonia (CAP). Drug utilization studies within the INOVA Health System revealed that levofloxacin is a cost-effective alternative to ciprofloxacin in infectious disease and that use of risk prediction criteria can reduce inappropriate hospitalizations for CAP, thereby reducing costs. In addition, the INOVA experience demonstrates that the strategy used to implement new antibiotic regimens such as switch-therapy regimens is an important factor in cost reduction: a therapeutic interchange mandate is more successful than standard educational techniques in changing treatment patterns.

PMID: 11446523 [PubMed - indexed for MEDLINE]

22: Pharmacotherapy. 2001 Jul;21(7 Pt 2):79S-82S.

[Related Articles, Links](#)

**Managing antiinfective therapy of community-acquired pneumonia in the hospital setting: focus on switch therapy.**

**Ramirez JA.**

Department of Medicine, University of Louisville School of Medicine, Kentucky 40292, USA.

Targeting patients for early switch from intravenous to oral antibiotic therapy and early hospital discharge is an important strategy in the management of community-acquired pneumonia (CAP). This strategy can reduce costs due to drug administration and length of hospital stay. We show that switch therapy can be implemented safely when four criteria are met: cough and respiratory distress improve, fever abates for at least 8 hours, white blood cell count is returning to normal, and patient can take drugs orally. In prospective clinical studies conducted at our institution, the clinical cure rate with switch therapy was 99%, and mean length of hospital stay was reduced by more than 2 days. Early switch, coupled with hospital discharge, may be possible in nearly half of all CAP patients. Universal use of switch therapy in the United States could result in the total reduction of about 440,000 hospital days annually and an overall savings of \$400 million.

PMID: 11446522 [PubMed - indexed for MEDLINE]

23: Pharmacotherapy. 2001 Jul;21(7 Pt 2):100S-104S.

[Related Articles, Links](#)

**The use of fluoroquinolones as antiinfective transition-therapy agents in community-acquired pneumonia.**

**Press RA.**

New York University Medical Center, New York 10016, USA.

The newer quinolone antibiotics, including levofloxacin, moxifloxacin, and gatifloxacin, offer coverage of the likely pathogens in community-acquired pneumonia (CAP) and have been shown to be safe and effective treatments for CAP. Two of these agents, levofloxacin and gatifloxacin, have pharmacokinetic and antibacterial properties that are similar in both oral and intravenous formulations. As such, they may be excellent candidates for transition therapy involving early switch from intravenous to oral therapy followed by early hospital discharge for patients with CAP.

Publication Types:

- Review
- Review, Tutorial

PMID: 11446520 [PubMed - indexed for MEDLINE]

24: Arch Intern Med. 2001 Mar 26;161(6):848-50.

[Related Articles, Links](#)

**Early switch from intravenous to oral antibiotics in hospitalized patients with bacteremic community-acquired Streptococcus pneumoniae pneumonia.**

**Ramirez JA, Bordon J.**

Division of Infectious Diseases, Department of Medicine, University of Louisville, Louisville, KY 40292, USA. j.ramirez@louisville.edu

**BACKGROUND:** The identification of Streptococcus pneumoniae bacteremia in hospitalized patients with community-acquired pneumonia is considered by some investigators to be an exclusion criterion for early switch from intravenous to oral therapy. **OBJECTIVE:** To determine whether the switch from intravenous to oral therapy in such patients, once the bacteremic patient reaches clinical stability, is associated with poor clinical outcome. **METHODS:** The medical records of 400 patients with community-acquired pneumonia hospitalized at the Veterans Affairs Medical Center of Louisville (Louisville, Ky) were reviewed to identify patients with bacteremic S pneumoniae. Four criteria were used to define when a patient reached clinical stability and should be considered a candidate for switch therapy: (1) cough and shortness of breath are improving, (2) patient is afebrile for at least 8 hours, (3) white blood cell count is normalizing, and (4) oral intake and gastrointestinal tract absorption are adequate. **RESULTS:** A total of 36 bacteremic patients were identified. No clinical failures occurred in 18 patients who reached clinical stability and were switched to oral therapy or in 7 patients who reached clinical stability and continued intravenous therapy. Clinical failures (5 deaths) occurred in the group of 11 patients who did not reach clinical stability. **CONCLUSION:** Once a hospitalized patient with community-acquired pneumonia reaches clinical stability, it is safe to switch from intravenous to oral antibiotics even if bacteremia caused by S pneumoniae was initially documented.

PMID: 11268227 [PubMed - indexed for MEDLINE]

25: Arch Intern Med. 2001 Mar 12;161(5):722-7.

[Related Articles, Links](#)

**Early switch and early discharge strategies in patients with community-acquired pneumonia: a meta-analysis.**

**Rhew DC, Tu GS, Ofman J, Henning JM, Richards MS, Weingarten SR.**

Zynx Health Inc, 9100 Wilshire Blvd, Suite 655, East Tower, Beverly Hills, CA 90212, USA. rhew@zynx.com

**BACKGROUND:** The effectiveness of early switch and early discharge strategies in patients with community-acquired pneumonia remains unknown. **METHODS:** We searched the MEDLINE, HEALTHSTAR, EMBASE, Cochrane Collaboration, and Best Evidence databases from January 1, 1980, to March 31, 2000, for community-acquired pneumonia studies that included specific switch criteria or recommendations to switch on a particular day. **RESULTS:** From 1794 titles identified, 121 articles were reviewed. We identified 10 prospective, interventional, community-acquired pneumonia-specific studies that evaluated length of stay (LOS). Nine studies applied an early switch from parenteral to oral antibiotic criteria. Six different criteria for switching were applied in the 9 studies. Five of the studies that applied early switch criteria also applied separate criteria for early discharge. Six studies applied an early switch and early discharge strategy to an intervention and control group, and 5 of these provided SD values for LOS. The mean change in LOS was not significantly ( $P = .05$ ) reduced in studies of early switch and early discharge (-1.64 days; 95% confidence interval, -3.30 to 0.02 days). However, when the 2 studies in which the recommended LOS was longer than the control LOS were excluded from the analysis, the mean change in LOS was reduced by 3 days (-3.04 days; 95% confidence interval, -4.90 to -1.19 days). Studies did not reveal significant differences in clinical outcomes between the intervention and control groups. **CONCLUSIONS:** There is considerable variability in early switch from parenteral to oral antibiotic criteria for patients with community-acquired pneumonia. Early switch and early discharge strategies may significantly and safely reduce the mean LOS when the recommended LOS is shorter than the actual LOS.

Publication Types:

- Meta-Analysis

PMID: 11231705 [PubMed - indexed for MEDLINE]



26: Rev Med Chil. 2000 Mar;128(3):267-72.

[Related Articles, Links](#)

**[Community acquired pneumonia: from intravenous to oral cephalosporin sequential therapy]**

[Article in Spanish]

**Fernandez P, San Martin L.**

Servicio de Medicina, Instituto Nacional del Torax, Santiago, Chile.

**BACKGROUND:** Many hospitalized patients with community acquired pneumoniae can be switched early in the course of therapy from intravenous to oral antibiotics, when there are subjective and objective indicators of improvement. This modality of treatment is called "switch therapy". **AIM:** To compare sequential therapy using an oral third generation cephalosporin, with conventional therapy using intravenous ceftriaxone in community acquired pneumonia. **PATIENTS AND METHODS:** Forty patients admitted due to community acquired pneumonia, initially treated with ceftriaxone 1 g/day i.v. and that showed clinical improvement after three days of therapy, were studied. They were randomly assigned to continue intravenous therapy with ceftriaxone for a total of 10 days or switched to ceftibuten 400 mg od for seven days. **RESULTS:** Twenty one patients continued i.v. treatment and 19 were switched to ceftibuten. There were no differences between both groups in terms of clinical cure, radiological improvement or normalisation of white blood cell count. **CONCLUSIONS:** Patients with community acquired pneumonia that have a good initial response to intravenous antimicrobials, can be safely switched to oral therapy. This therapy will shorten hospital stay and thereby treatment costs.

Publication Types:

- Clinical Trial
- Randomized Controlled Trial

PMID: 10962867 [PubMed - indexed for MEDLINE]



27: Pharm World Sci. 2000 Apr;22(2):53-8.

[Related Articles, Links](#)

**Clinical and economic impact of a pharmacist-intervention to promote sequential intravenous to oral clindamycin conversion.**

**Martinez MJ, Freire A, Castro I, Inaraja MT, Ortega A, Del Campo V, Rodriguez I, Bardan B, Morano LE, Garcia JF.**

Department of Pharmacy, Meixoeiro Hospital, Pontevedra, Spain. mjmarvaz@unimeixo.cesga.es

A multicentre, prospective, controlled study compared the clinical efficacy, safety and economic impact of a pharmacist intervention to promote sequential intravenous to oral clindamycin conversion. A total of 473 patients receiving intravenous clindamycin for at least 72 hours were included in the study. Two groups were established: an intervention group (204 patients) in which an informative sheet recommending the sequential treatment was provided, and a control group (269 patients). Clindamycin was prescribed for respiratory infections in 38.9% and for prophylaxis in surgery in 25.4% of the patients (71% were contaminated surgery). No difference between groups regarding sex, infection severity, health status or clinical progress was observed. Both the step-down treatments after 72 hours of intravenous clindamycin and the change to the oral route later on, were significantly increased with the intervention ( $p < 0.001$ ,  $p < 0.001$  respectively). No significant differences between both groups were found in the number of patients with adverse effects associated with the i.v. therapy, although the incidence tended to be lower in the intervention group (49/204 intervention versus 85/269 control,  $p = 0.07$ ). Compliance with the recommended clindamycin dosing regimen was significantly higher in the intervention group, in which 1.3 days reduction of intravenous therapy provided an average cost savings of PTA5246 (95% CI 2556-7935) per treatment. A higher reduction of 1.7 days was achieved in those patients candidates for switch therapy on the third day of intravenous clindamycin. A sequential program with clindamycin may provide a cost-effective alternative to conventional therapy and the introduction of an information sheet is a cost-effective strategy to promote it.

PMID: 10849923 [PubMed - indexed for MEDLINE]

28: Arch Intern Med. 1999 Nov 8;159(20):2449-54.

[Related Articles, Links](#)

**Early switch from intravenous to oral antibiotics and early hospital discharge: a prospective observational study of 200 consecutive patients with community-acquired pneumonia.**

**Ramirez JA, Vargas S, Ritter GW, Brier ME, Wright A, Smith S, Newman D, Burke J, Mushtaq M, Huang A.**

Department of Medicine, University of Louisville School of Medicine and Veterans Affairs Medical Center, KY 40202, USA.

To determine the proportion of patients who can be treated with early switch to oral antibiotics and early discharge, to evaluate clinical outcome and patient satisfaction for patients treated with early switch and early discharge, and to define the factors that interfere with early discharge for some of the patients who underwent early switch to oral antibiotic therapy. Design: Prospective study. Participants: Two hundred consecutive hospitalized patients with community-acquired pneumonia. Main Outcome Measures: Number of days needed to switch to oral therapy and length of hospital stay. Clinical outcome and satisfaction with care were evaluated for those patients treated with early switch and early discharge. Results: Early switch to oral antibiotics (within the first 3 days of hospitalization) was performed in 133 patients (67%). Clinical failure was documented in 1 patient. Early switch and early discharge was performed in 88 patients (44%). The mean length of hospital stay for this group was 3.4 days. The most common reason for prolonged hospitalization after the switch to oral antibiotics was the need for diagnostic workup. More than 95% of patients were satisfied with the care they had received. Conclusions: Using simple clinical and laboratory criteria, a significant proportion of hospitalized patients with community-acquired pneumonia (44%) can be treated with early switch and early discharge. This model did not affect patient outcome, decreased the length of hospitalization, and was associated with a high level of patient satisfaction.

PMID: 10665893 [PubMed - indexed for MEDLINE]

29: Ned Tijdschr Geneeskd. 1999 Nov 20;143(47):2364-9.

[Related Articles, Links](#)

**[Early change from intravenous to oral antibiotics: 'switch therapy']**

[Article in Dutch]

**Sevinc F, Prins JM, Koopmans RP, Langendijk PN, Dankert J, Speelman P.**

Afd. Inwendige Geneeskunde, onderafd. Infectieziekten, Tropische Geneeskunde en Aids, Academisch Medisch Centrum/Universiteit van Amsterdam.

There has been growing interest in recent years in early switch therapy: antibiotics are administered intravenously during the early phase of the infection, and then continued orally. A large number of recent prospective and randomized studies justify the application of an early switch. There is consensus in the literature about the circumstances in which an early switch is justified: (a) the patient must show clinical improvement; (b) the oral therapy should result in sufficiently high levels at the infection site; (c) the patient must be capable of taking oral medication, there must be no signs of malabsorption and interactions with food or with other drugs should be taken into account; (d) if these rules are observed, switch to oral therapy as a rule is justified after 2 to 3 days' intravenous administration. An early switch is more comfortable to the patient, eases the load on the nursing staff and considerably reduces expenses.

Publication Types:

- Review
- Review, Tutorial

PMID: 10590775 [PubMed - indexed for MEDLINE]

30: Proc AMIA Symp. 1999:415-9.

[Related Articles, Links](#)

**An information system to promote intravenous-to-oral medication conversion.**

**Teich JM, Petronzio AM, Gerner JR, Seger DL, Shek C, Fanikos J.**

Partners HealthCare System, Boston, MA, USA.

Many inpatients remain on expensive intravenous medications, even after they become able to take bioequivalent oral alternatives. We developed a computer intervention to identify such patients and to deliver alerts suggesting a switch to the oral medication. In the first phase of the project, alerts were delivered to pharmacists. The Brigham Integrated Computer System (BICS) was used to produce a daily report of patients receiving any of six targeted intravenous medications, who also had orders for an oral diet or other scheduled oral medications. Staff pharmacists screened the report and suggested IV to PO conversion in appropriate cases to the patient's nurses and/or physicians. Feedback was documented in the BICS system. Analysis of the pilot study showed that in 31.7% of cases, physicians agreed to change (or had just changed) the patient's medication from IV to PO. Further analysis of pilot (Phase I) data was performed against a variety of parameters in order to increase the fraction of alerts deemed appropriate for conversion. These more specific alerts can be sent directly to physicians.

PMID: 10566392 [PubMed - indexed for MEDLINE]

**Strategies for early discharge of the hospitalized patient with community-acquired pneumonia.****Siegel RE.**

Department of Medicine, Mount Sinai School of Medicine, New York, New York, USA.

The treatment of the hospitalized patient with uncomplicated CAP is changing, to include a brief period of intravenous antibiotics followed by oral therapy. The Classification of Community-Acquired Pneumonia or CoCAP is a stratification tool that categorizes patients as low-risk pneumonia, unstable pneumonia, or complicated pneumonia. Use of validated hospital admission criteria, combined with the CoCAP algorithm and evolving criteria for switching patients from intravenous to oral therapy provides a structure for organizing treatment of patients with CAP for caregivers. Patients who can be discharged early are those from the unstable pneumonia group, which includes patients who have had reversal of their metabolic problems and stabilization of comorbid conditions, and who have not developed any serious pneumonia-related complications. Prolonged courses of intravenous antibiotic therapy are being replaced with 2 to 3 day courses of intravenous hydration and antibiotics; a switch to oral therapy and hospital discharge can be achieved after the patient tolerates one dose of oral therapy. Parameters to watch include vital signs and white blood cell count. Provided these parameters are improving, although they may not have returned to normal, the patient can be switched to oral therapy. Although patient treatment guidelines and critical pathways are becoming widespread in disease management, CAP is one disease in which prospective studies have demonstrated that a reduction in hospital stay is safe. Patients, caregivers, and administrators are happy with the reduction in hospital LOS. Other treatment protocols are being explored, including a single dose of intravenous antibiotic prior to oral switch and all-oral regimens employing the newer fluoroquinolones.

Publication Types:

- Review
- Review, Tutorial

PMID: 10516907 [PubMed - indexed for MEDLINE]

**Early switch from intravenous to oral antibiotics: guidelines and implementation in a large teaching hospital.****Sevinc F, Prins JM, Koopmans RP, Langendijk PN, Bossuyt PM, Dankert J, Speelman P.**

Department of Internal Medicine, Academic Medical Center, Amsterdam, The Netherlands.

In recent years 'switch therapy' has been advocated: short intravenous antibiotic therapy, for 2-3 days, followed by oral treatment for the remainder of the course. Little is known about the number of patients that could benefit from early switch therapy and the consequences of introducing this strategy in everyday practice. We prospectively registered all antibiotic courses on wards for Internal Medicine, Surgery, and Pulmonology during a 2 month period, before (n = 362, inventorial phase) and after (n = 281, implementation phase) the introduction of guidelines for switching therapy. Approximately 40% of all patients who started on iv antibiotics were candidates for an early iv-oral switch. During the inventorial phase, 54% (52/97) of eligible patients were switched to oral treatment, after a median of 6 days (range 2-28 days). After implementation of the guidelines, this percentage rose to 83% (66/80) (difference 29%, 95% CI 16-42%; P < 0.001). Therapy was also switched earlier, after a median of 4 days (range 2 to 16 days). In the 6 weeks after completion of the oral course, recurrence of infections, or readmissions due to reinfections did not occur. Compared with the inventorial phase, 43% of iv administrations could be avoided, that is >6000 per year. This means a potential annual reduction of dfl.60,000 (c. US\$30,000) of administration costs. The potential savings in purchase costs of the antibiotics were dfl.54,000 (US\$27,000) annually. In conclusion, a substantial number of patients starting on iv antibiotics were candidates for an early iv-oral switch. The guidelines were well accepted by the physicians and substantial savings in costs and nursing time were achieved.

PMID: 10350396 [PubMed - indexed for MEDLINE]

**Early transition to oral antibiotic therapy for community-acquired pneumonia: duration of therapy, clinical outcomes, and cost analysis.****Omidvari K, de Boisblanc BP, Karam G, Nelson S, Haponik E, Summer W.**

Louisiana State University Medical Center, New Orleans 70112, USA.

Our objective was to compare therapeutic outcome and analyse cost-benefit of a 'conventional' (7-day course of i.v. antibiotic therapy) vs. an abbreviated (2-day i.v. antibiotic course followed by 'switch' to oral antibiotics) therapy for in-patients with community-acquired pneumonia (CAP). We used a multicenter prospective, randomized, parallel group with a 28 day follow-up, at the University-based teaching hospitals: The Medical Center of Louisiana in New Orleans, LA and hospitals listed in the acknowledgement. Ninety-five patients were randomized to receive either a 'conventional' course of intravenous antibiotic therapy with cefamandole 1 g i.v. every 6 h for 7 days (n = 37), or an abbreviated course of intravenous therapy with cefamandole (1 g i.v. every 6 h for 2 days) followed by oral therapy with cefaclor (500 mg every 8 h for 5 days). No difference was found in the clinical courses, cure rates, survival or the resolution of the chest radiograph abnormalities among the two groups. The mean duration of therapy (6.88 days for the conventional group compared to 7-30 days for the early oral therapy group) and the frequencies

of overall symptomatic improvement (97% vs. 95%, respectively) were similar in both groups. Patients who received early oral therapy had shorter hospital stays (7.3 vs. 9.71 days,  $P = 0.01$ ), and a lower total cost of care (\$2953 vs. \$5002,  $P < 0.05$ ). It was concluded that early transition to an oral antibiotic after an abbreviated course of intravenous therapy in CAP is substantially less expensive and has comparable efficacy to conventional intravenous therapy. Altering physicians' customary management of hospitalized patients with CAP can reduce costs with no appreciable additional risk of adverse patient outcome.

Publication Types:

- Clinical Trial
- Multicenter Study
- Randomized Controlled Trial

PMID: 9893772 [PubMed - indexed for MEDLINE]



34: Conn Med. 1998 Nov;62(11):665-8.

[Related Articles, Links](#)

#### **Antimicrobial switch therapy.**

**Bui K, Quintiliani R.**

Hartford Hospital, University of Connecticut, School of Pharmacy, Storrs, USA.

Publication Types:

- Review
- Review, Tutorial

PMID: 9874890 [PubMed - indexed for MEDLINE]



35: J Infect. 1998 Jul;37 Suppl 1:51-4.

[Related Articles, Links](#)

#### **Implementation of sequential therapy programs--a microbiologist's view.**

**Wilcox MH.**

Department of Microbiology, University of Leeds and The General Infirmary, UK.

Sequential antimicrobial therapy is not new, but confusion about the timing and nature of the switch often negates perceived advantages. A common problem is the choice of oral antibiotic to follow empirical administration of an intravenous second or third generation cephalosporin. Where guidelines do not exist, particularly when data are lacking as the the best option, the Delphi technique of obtaining a consensus agreement by review of a series of case histories is recommended. Majority verdicts are used to determine what is acceptable practice, and as such the approach is also suitable for audit. Savings through reduced drug acquisition costs and shorter lengths of stay have been highlighted. However, other less obvious potential benefits of sequential antimicrobial therapy include reduced incidence of intravascular catheter infection because of shorter line dwell times and less endoluminal contamination. Sequential antimicrobial therapy may also be used as part of a policy to reduce the selective pressure, particularly due to cephalosporin use, for endemic hospital pathogens such as *Clostridium difficile* and extended spectrum producing gram-negative bacilli.

PMID: 9756370 [PubMed - indexed for MEDLINE]



36: Chemotherapy. 1998 Sep;44 Suppl 1:24-7.

[Related Articles, Links](#)

#### **Cefixime for switch therapy.**

**Hamilton-Miller J.**

Department of Medical Microbiology, Royal Free Hospital School of Medicine, London, UK.

Switch therapy, or step-down therapy, is the concept of switching from an intravenous antibiotic to an oral preparation after a few days, once the condition of the patient has improved and the pathogen and its susceptibility have been determined. The orally active third-generation cephalosporin cefixime is a primary candidate for switch therapy owing to its very good efficacy and safety profile. Preliminary studies have shown excellent clinical outcomes with switch therapy to cefixime after 2-3 days for a variety of serious infections. Importantly, dramatic cost benefits have also been found, particularly with respect to reduced length of hospital stays. However, guidelines are required to indicate under what conditions switch therapy is appropriate, and awareness must be developed within hospitals among physicians, pharmacists and administrators alike.

PMID: 9797420 [PubMed - indexed for MEDLINE]

37: J Antimicrob Chemother. 1998 Jul;42(1):107-11.

[Related Articles, Links](#)

**The effect of intravenous-to-oral switch guidelines on the use of parenteral antimicrobials in medical wards.**

**Laing RB, Mackenzie AR, Shaw H, Gould IM, Douglas JG.**

Infection Unit, Aberdeen Royal Infirmary, Foresterhill, UK.

The effect of an intravenous (i.v.)-to-oral switch policy on antibiotic prescribing in general medical wards was examined. Three audits, each of 2 months' duration, were carried out to examine the duration of i.v. therapy and length of patient stay. The first audit (S1) was performed before the introduction of switch guidelines, the second (S2) after guidelines had been placed in patient case-notes and the third (S3) after the guidelines had been introduced into the drug charts. The duration of i.v. therapy was significantly shorter in the S3 group (mean = 3.7 days) than in the S2 or S1 groups (mean 4.4 and 4.35 days, respectively) ( $P < 0.05$ ). There was no significant difference in the length of patient stay between the three audit periods but the stay was significantly shorter in 81 switched patients (mean duration = 8.9 days) than in matched controls (mean duration = 12.6 days) ( $P = 0.01$ ). Fewer patients with respiratory infection were treated for  $> 24$  h with i.v. antimicrobials in the S3 audit period (75/549) than in the S2 (85/372) and S1 audits (83/326) ( $P < 0.01$ ). The introduction of switch guidelines to drug charts reduces the length of i.v. therapy. Switched patients spend less time in hospital than their matched controls.

PMID: 9700538 [PubMed - indexed for MEDLINE]

38: Pediatr Infect Dis J. 1998 Jul;17(7):626-31.

[Related Articles, Links](#)

**Sequential use of intravenous and oral acyclovir in the therapy of varicella in immunocompromised children.**

**Carcao MD, Lau RC, Gupta A, Huerter H, Koren G, King SM.**

Department of Pediatrics, The Hospital for Sick Children, Toronto, Ontario, Canada.

**BACKGROUND:** Immunocompromised children are at risk for disseminated varicella infections. Standard management involves hospitalization and intravenous acyclovir for 7 to 10 days. This approach is expensive, is inconvenient and may not be necessary. We undertook a pilot study to assess the safety and efficacy of an alternative approach that utilized a combination of intravenous (i.v.) followed by oral (p.o) acyclovir in a cohort of immunocompromised children. **METHODS:** The cohort consisted of 26 immunocompromised children between the ages of 1.5 and 12.7 years (mean, 6.3). Therapy was commenced with i.v. acyclovir (1500 mg/m<sup>2</sup>/day in 3 divided doses). Concurrent management included holding or reducing immunosuppressive therapy (by 50%) and administering varicella-zoster immunoglobulin in 69% (11 of 16) of cases where exposure to chickenpox was recognized. Patients were eligible to switch to p.o therapy after receiving a minimum of 48 h of i.v. acyclovir therapy provided they were afebrile; had no new lesions for 24 h; had no internal organ involvement and were able to tolerate oral medications. Patients were observed in hospital for a further 24 h and then discharged provided they remained well. Oral acyclovir was continued for a total of 7 to 10 days (i.v. plus p.o). **RESULTS:** Of the 26 patients 25 were successfully switched from i.v. to p.o after 4.1 +/- 1.2 days (mean +/- SD) (range, 2.3 to 6) Children had fever for a mean of 2.0 +/- 1.6 days (range, 0 to 5) and developed new lesions for 2.9 +/- 0.7 days (range, 2 to 4). All 25 patients switched to p.o therapy had resolution of their disease and no patient required resumption of i.v. therapy. **CONCLUSIONS:** The sequential use of i.v. followed by p.o acyclovir is feasible in the treatment of varicella in immunocompromised children and results in a reduction in duration of intravenous therapy and hospitalization.

Publication Types:

- Clinical Trial

PMID: 9686730 [PubMed - indexed for MEDLINE]

39: Semin Respir Infect. 1998 Mar;13(1):36-42.

[Related Articles, Links](#)

**Duration and route of antibiotic therapy in community-acquired pneumonia: switch and step-down therapy.**

**Cassiere HA, Fein AM.**

Department of Medicine, SUNY at Stony Brook, NY, USA.

The treatment of hospitalized patients with community-acquired pneumonia (CAP) has traditionally been with intravenous antibiotics. More recently, the focus of this antibiotic therapy has been empiric and based on the most likely pathogens in a given patient. The concept of when and how to approach the patient for conversion to oral therapy, known as switch therapy, is now the focus of controversy. Recently, several studies have emerged from the literature that shed some light on the subject of switch therapy for CAP. Although the data are limited at this time, it seems clear that switching to oral antibiotics in selected low-risk patients may be feasible and safe. In this article, we focus on the problem and help formulate a practical approach to switching patients from intravenous antibiotics to oral therapy for CAP.

Publication Types:

- Review
- Review, Tutorial

PMID: 9543474 [PubMed - indexed for MEDLINE]

[Related Articles, Links](#)

40: Ann Pharmacother. 1998 Jan;32(1):S22-6.

**Switch therapy with beta-lactam/beta-lactamase inhibitors in patients with community-acquired pneumonia.**

**Ramirez JA.**

Department of Medicine, School of Medicine, University of Louisville, KY 40292, USA.

**BACKGROUND:** Antimicrobial drugs are prescribed inappropriately nearly 50% of the time. To address this problem, a hospital antimicrobial team was formed integrating the talents of infectious disease physicians, pharmacists, microbiologists, infectious control practitioners, and nurses. The primary goal of the team is to provide optimal, cost-effective antimicrobial therapy. **OBJECTIVE:** To review the principles of streamlining antimicrobial therapy, with an emphasis on antibiotic switch therapy. **DISCUSSION:** With appropriate guidelines, switch therapy appears to be an important means to provide optimal antimicrobial therapy complementing the many social pressures placed on patients, while positively impacting on the overall cost of treatment. The use of beta-lactam/beta-lactamase inhibitor combinations as the antibiotics for initial intravenous medication to oral combination switch therapy is a viable approach to the treatment of hospitalized patients with community-acquired pneumonia. Preliminary data from our institution were obtained with such a therapeutic approach to assess the clinical efficacy, patient satisfaction with their care, and calculated dollar savings in the overall cost of care. The results of this evaluation strongly support the validity and desirability of such an approach. **CONCLUSIONS:** The prospective use of a program that incorporates the use of beta-lactam/beta-lactamase inhibitor combinations for intravenous and switch-to-oral drug administration is a cost-effective means of providing optimal antimicrobial therapy for patients with community-acquired pneumonia.

Publication Types:

- Review
- Review, Tutorial

PMID: 9475836 [PubMed - indexed for MEDLINE]

Items 41 - 60 of 61

[Previous](#) 3 of 4 [Next](#)

[Related Articles, Links](#)

41: Ann Pharmacother. 1997 Oct;31(10):1137-45.

**Cost-effectiveness comparison of sequential ofloxacin versus standard switch therapy.**

**Partsch DJ, Paladino JA.**

State University of New York at Buffalo, USA.

**OBJECTIVE:** To compare the cost-effectiveness of sequential intravenous-to-oral ofloxacin versus intravenous-to-oral standard switch therapy for the treatment of patients with sepsis who are hospitalized with bacterial infections. **DESIGN:** Cost-effectiveness analysis from a provider perspective, including resources important to an integrated healthcare network, of a randomized, open-label, controlled, clinical trial. **SETTING:** Millard Fillmore Health System, Buffalo, NY. **PATIENTS:** Hospitalized adults requiring parenteral antibiotics for a complicated urinary tract infection, lower respiratory tract infection, or skin and soft tissue infection. **INTERVENTIONS:** Sequential intravenous-to-oral ofloxacin or standard intravenous-to-oral switch antibiotics. **OUTCOME MEASURES:** Clinical outcomes and direct costs associated with hospitalization, primary physician services, specialist physician services, and outpatient care. **RESULTS:** Eighty-two of 89 patients randomized into the two treatment groups were evaluable. Standard switch therapy failed with 12 patients versus 10 patients receiving ofloxacin. Complete economic data were available for 74 patients. Sequential ofloxacin therapy resulted in a 1-day-shorter antibiotic-related hospitalization without evidence of recurrent infection during the posttherapy follow-up evaluations. An average cost savings of \$399 per patient was achieved in the sequential ofloxacin group. Although this difference did not attain statistical significance (probably due to the large variance), it is an economically significant finding. The cost-effectiveness ratios were \$5735 per successful outcome for the standard switch therapy group versus \$5126 per successful outcome in the sequential ofloxacin group. **CONCLUSIONS:** Sequential ofloxacin was as effective and consistently less expensive than standard switch antibiotics in the initial evaluation and in the sensitivity analysis of room cost and drug acquisition cost. Standard switch therapy would have to be greater than 25% more effective than sequential ofloxacin therapy to change the economic decision.

Publication Types:

- Clinical Trial
- Randomized Controlled Trial

PMID: 9337437 [PubMed - indexed for MEDLINE]

[Related Articles, Links](#)

42: Chest. 1997 Aug;112(2):406-15.

**Sequential therapy with cefuroxime followed by cefuroxime axetil in community-acquired pneumonia.**

**Van den Brande P, Vondra V, Vogel F, Schlaeffer F, Staley H, Holmes C.**

Pulmonary Division, Hospital St. Norbertus Duffel, Katholieke Universiteit Leuven, Belgium.

**STUDY OBJECTIVES:** To compare the efficacy of two sequential therapy regimens of IV cefuroxime followed by oral cefuroxime axetil for the treatment of community-acquired pneumonia (CAP). **DESIGN:** Prospective, multicenter, randomized, open-label, parallel-group study. **SETTING:** Sixty-six centers in 11 countries (Belgium, Canada, Czech Republic, Germany, Hungary, Ireland, Israel, Poland, Portugal, South Africa, and the United Kingdom). **PATIENTS:** Six hundred thirty-six adults with CAP requiring hospitalization and initial IV antibiotic treatment. **INTERVENTIONS:** Cefuroxime, 1.5 g IV tid or bid for 48 to 72 h followed by oral cefuroxime axetil, 500 mg bid for 7 days. **MEASUREMENTS AND RESULTS:** For clinically evaluable patients, the clinical response rates were equivalent for cefuroxime tid and bid groups posttreatment (cure/improvement, 79% and 84%, respectively) and at follow-up (maintained cure, 87% and 82%, respectively). All signs and symptoms of pneumonia showed improvement at the time of switch from IV to oral therapy. A total of 111 pathogens were isolated, the most common being *Streptococcus pneumoniae* (23%), *Haemophilus influenzae* (18%), and *Enterobacteriaceae* (15%). Bacteriologic clearance was obtained posttreatment in 47 of 49 and 36 of 42 of bacteriologically evaluable patients in the cefuroxime tid and bid groups, respectively. Both regimens were well tolerated with a low incidence of drug-related adverse events, the most common being GI. **CONCLUSIONS:** Twice daily IV cefuroxime followed by oral cefuroxime axetil is a simple and effective sequential therapy regimen for the treatment of CAP. It offers potential cost savings and can replace the current tid regimen in this indication.

Publication Types:

- Clinical Trial
- Multicenter Study
- Randomized Controlled Trial

PMID: 9266876 [PubMed - indexed for MEDLINE]



43: Pharmacotherapy. 1997 May-Jun;17(3):569-75.

[Related Articles, Links](#)

**Early switch from intravenous to oral antibiotics in hospitalized patients with infections: a 6-month prospective study.**

**Ahkee S, Smith S, Newman D, Ritter W, Burke J, Ramirez JA.**

Division of Infectious Diseases, University of Louisville School of Medicine, KY 40292, USA.

We assessed what percentage of hospitalized patients treated with intravenous antibiotics would be candidates for early switch to oral therapy, and evaluated the clinical outcomes of patients after the switch. All hospitalized patients in whom an intravenous antibiotic was prescribed for treatment of an infection were prospectively screened to identify candidates for switch in therapy. Of the 655 patients treated with intravenous antibiotics, 300 (46%) were candidates for a switch, and the change was implemented in 262 (40%). Of the 171 evaluable patients, the switch was associated with clinical cure in 167 (98%) and failure in 4 (2%). In hospitalized patients with infections, the duration of intravenous antibiotic therapy can be minimized with early switch to oral therapy. This practice is associated with good patient outcome.

PMID: 9165561 [PubMed - indexed for MEDLINE]



44: Postgrad Med. 1997 Apr;101(4):111-2, 115-8, 122-3 passim.

[Related Articles, Links](#)

**Intravenous-to-oral antibiotic switch therapy. A cost-effective approach.**

**Cunha BA.**

Infectious disease division, Winthrop-University Hospital, Mineola, New York 11501, USA.

Every attempt should be made to switch hospitalized infectious-disease patients from intravenous to oral antibiotic therapy as soon as clinical improvement makes it possible. In addition to tremendous cost savings, the advantages of oral therapy are impressive and include a decrease in the number of nosocomial infections, shorter length of hospital stay, and lower incidence of intravenous-line infections. The main barrier to the acceptance of switch therapy is a lack of understanding of its efficacy, safety, and cost advantages. The wide-scale institution of managed care has resulted in the dawning of the era of oral antimicrobial therapy. Everything from infective endocarditis in intravenous drug abusers to neuroborreliosis may be treated effectively by the oral route.

Publication Types:

- Review
- Review, Tutorial

PMID: 9126207 [PubMed - indexed for MEDLINE]

45: Pharmacoeconomics. 1997 Jan;11(1):64-74.

[Related Articles, Links](#)

**Cost-effectiveness of abbreviating the duration of intravenous antibacterial therapy with oral fluoroquinolones.**

**Jensen KM, Paladino JA.**

Clinical Pharmacokinetics Laboratory, Millard Fillmore Health System, University at Buffalo, New York, USA.

Comprehensive economic analyses should include outpatient as well as inpatient resources. A healthcare system that includes both inpatient and outpatient care, such as prescriptions, physician care, laboratory tests and multiple other items, has been termed an Integrated Healthcare Network (IHN). Thus, cost-effectiveness analyses from the perspective of an IHN are necessary. We report a cost-effectiveness analysis from an IHN perspective on 187 evaluable hospitalised patients with serious infection who participated in randomised clinical trials that evaluated either: (i) standard regimens of intravenous (i.v.) antibacterial therapy, usually followed by oral antibacterial therapy; or (ii) an abbreviated regimen of intravenous antibacterials for 2 to 4 days, followed by either oral ciprofloxacin or oral enoxacin as early switch therapy. Clinical success rates were similar for the 2 treatment groups. The median number of days of in-hospital antibacterial treatment was 11 for standard i.v. therapy and 10 for switch therapy. Adverse events occurred in 33% of the standard i.v. therapy group and in 50% of the switch therapy group. Sensitivity analysis of drug price and hospital bed cost showed that switch therapy was consistently more cost effective than standard i.v. therapy. Standard i.v. therapy would have to be 10% more effective than switch therapy to change the economic decision. In this analysis, switch therapy was a cost-effective treatment with no demonstrated change in efficacy compared with standard i.v. therapy.

Publication Types:

- Clinical Trial
- Randomized Controlled Trial

PMID: 10165528 [PubMed - indexed for MEDLINE]

46: Pharm Pract Manag Q. 1996 Oct;16(3):19-34.

[Related Articles, Links](#)

**Antibiotic streamlining: development and justification of an antibiotic streamlining program.**

**Ramirez JA.**

Division of Infectious Diseases, University of Louisville, School of Medicine, KY, USA.

Several techniques can be applied to streamline or optimize antimicrobial therapy in the hospitalized patient. As soon as there is a documented clinical response to intravenous therapy, the antibiotic can be switched to the oral route of administration. This antimicrobial streamlining technique is called switch therapy. This article presents the development of the switch therapy concept, the good clinical outcome obtained with switch therapy in patients with community and nosocomial pneumonia, as well as the cost-savings to our institution after the implementation of this program.

PMID: 10166232 [PubMed - indexed for MEDLINE]

47: Leuk Lymphoma. 1996 Sep;23(1-2):159-63.

[Related Articles, Links](#)

**Stepdown single agent antibiotic therapy for the management of the high risk neutropenic adult with hematologic malignancies.**

**Horowitz HW, Holmgren D, Seiter K.**

Department of Medicine, Westchester County Medical Center, Valhalla, New York 10595, USA.

The standard of therapy for the high risk adult neutropenic host being treated with broad spectrum antibiotics for fever has been to continue intravenous antibiotics until neutropenia resolves. We performed a small, limited pilot study to determine if it is safe to switch these patients to oral monotherapy with ciprofloxacin. Ten patients with hematologic malignancies who had  $\leq 108$  granulocytes/mm<sup>3</sup> after cytoreductive therapy and were afebrile for at least five days had intravenous antibiotics discontinued and were placed on oral ciprofloxacin. Eight patients were able to be discharged from the hospital and seven were treated without the need for reinstitution of intravenous therapy. Of the three failures, one developed fever with a new bloodstream infection and two developed fever with relapse of leukemia. Patients remained on ciprofloxacin an average of 14.5 days (range 4 to 35 days). Aggregate cost savings for the 10 patients from this approach were estimated to be \$11,400 for antibiotics and \$88,800 for hospitalization. If corroborated in larger, randomized studies, the use of "stepdown monotherapy" may be a cost effective approach to the management of the stable neutropenic patient.

Publication Types:

- Clinical Trial
- Controlled Clinical Trial

PMID: 9021700 [PubMed - indexed for MEDLINE]

48: Clin Nephrol. 1996 Sep;46(3):183-6.

[Related Articles, Links](#)

**Prospective, randomized, controlled study comparing two dosing regimens of gentamicin/oral ciprofloxacin switch therapy for acute pyelonephritis.**

**Bailey RR, Begg EJ, Smith AH, Robson RA, Lynn KL, Chambers ST, Barclay ML, Hornibrook J.**

Department of Nephrology, Christchurch Hospital, New Zealand.

Aminoglycosides are drugs of choice for severe gram-negative urinary tract sepsis. Recent evidence suggests that they are just as efficacious, but less nephrotoxic and ototoxic, if given as a single daily dose rather than in divided doses. We considered that a single, large dose of an aminoglycoside followed by oral therapy with a different antibiotic might be equally effective and possibly less toxic. This randomized, controlled study compared a single large i.v. dose (10 mg/kg) of gentamicin (S) with a standard multiple dose regimen (M) of gentamicin (2.5 mg/kg i.v. stat and then computer generated divided doses aiming for peak and trough concentrations of 8 and 1.5 mg/l respectively) for the treatment of patients with suspected acute pyelonephritis requiring hospitalization for parenteral antibiotic treatment. All patients were switched to oral ciprofloxacin either four hours after the S dose or when clinically appropriate in the M regimen. For all patients the total duration of treatment was five days. Fifty-three patients (48 women; mean age 32 yr) were enrolled. Clinical and bacteriological efficacy could be assessed in 41 patients. Thirteen of 16 in the S arm and 24 of 25 in the M arm were clinically cured and the other four clinically improved. Fifteen of 16 in the S arm and 23 of 25 in the M arm were cured bacteriologically (sterile urine 7-10 days after treatment). In 41 patients high tone audiometry was carried out before or very soon after the start of treatment, and again at the end of treatment. Ototoxicity ( $\geq 10$  dB loss in  $\geq 2$  frequencies in both ears) was observed in 3 of 18 in the S group (17%) and 7 of 23 in the M group (30%) (NS). Other side-effects and toxicity were mild and not different between groups. Substantial cost savings occurred in the S group. In summary, a large single dose of gentamicin was comparable in efficacy and toxicity to a standard regimen, but cheaper and more convenient to use.

Publication Types:

- Clinical Trial
- Randomized Controlled Trial

PMID: 8879853 [PubMed - indexed for MEDLINE]

49: Therapie. 1996 Jul-Aug;51(4):464-75.

[Related Articles, Links](#)

**[Value of the use of the oral route versus the injectable route for fluoroquinolones. Pharmacoeconomic incidence and bibliographical study]**

[Article in French]

**Douet C, Charpiat B, Peyramond D, Brazier JL.**

Service Pharmacie, Hopital de la Croix-Rousse, Lyon, France.

The aim of this study was to research the optimal conditions to shift to oral from injectable administration route for the fluoroquinolone antibiotics and the pharmacoeconomic and therapeutic impact of such a shift. Two indicators were used: proportion of the two administration routes, and mean cost per administration. The published results of pharmacokinetic studies in healthy and diseased subjects, and the clinical and/or pharmacokinetic studies including the notion of a therapeutic shift from the parenteral route to the oral route have been selected. The bioequivalence pharmacokinetic parameters of oral and injectable forms and the major clinical data of the therapeutic shift have been listed. Literature analysis reveals that there are few studies covering the specific assessment of the switch. The financial consequences of oral administration early use show the importance of such studies.

Publication Types:

- Review
- Review, Academic

PMID: 8953832 [PubMed - indexed for MEDLINE]

50: Arch Intern Med. 1996 Jun 10;156(11):1235.

[Related Articles, Links](#)

Comment on:

- [Arch Intern Med. 1995 Jun 26;155\(12\):1273-6.](#)

**Switch therapy in community-acquired pneumonia.**

**Nathwani D, Boyter A, Fegan PG, Davey P.**

Publication Types:

- Comment
- Letter

PMID: 8639018 [PubMed - indexed for MEDLINE]

51: Ann Surg. 1996 Mar;223(3):303-15.

[Related Articles, Links](#)

**Results of a randomized trial comparing sequential intravenous/oral treatment with ciprofloxacin plus metronidazole to imipenem/cilastatin for intra-abdominal infections. The Intra-Abdominal Infection Study Group.**

**Solomkin JS, Reinhart HH, Dellinger EP, Bohnen JM, Rotstein OD, Vogel SB, Simms HH, Hill CS, Bjornson HS, Haverstock DC, Coulter HO, Echols RM.**

Department of Surgery, University of Cincinnati College of Medicine, Ohio, 45267-0558, USA.

**OBJECTIVE:** In a randomized, double-blind, multicenter trial, ciprofloxacin/metronidazole was compared with imipenem/cilastatin for treatment of complicated intra-abdominal infections. A secondary objective was to demonstrate the ability to switch responding patients from intravenous (IV) to oral (PO) therapy. **SUMMARY BACKGROUND DATA:** Intra-abdominal infections result in substantial morbidity, mortality, and cost. Antimicrobial therapy often includes a 7- to 10-day intravenous course. The use of oral antimicrobials is a recent advance due to the availability of agents with good tissue pharmacokinetics and potent aerobic gram-negative activity. **METHODS:** Patients were randomized to either ciprofloxacin plus metronidazole intravenously (CIP/MTZ IV) or imipenem intravenously (IMI IV) throughout their treatment course, or ciprofloxacin plus metronidazole intravenously and treatment with oral ciprofloxacin plus metronidazole when oral feeding was resumed (CIP/MTZ IV/PO). **RESULTS:** Among 671 patients who constituted the intent-to-treat population, overall success rates were as follows: 82% for the group treated with CIP/MTZ IV; 84% for the CIP/MTZ IV/PO group; and 82% for the IMI IV group. For 330 valid patients, treatment success occurred in 84% of patients treated with CIP/MTZ IV, 86% of those treated with CIP/MTZ IV/PO, and 81% of the patients treated with IMI IV. Analysis of microbiology in the 30 patients undergoing intervention after treatment failure suggested that persistence of gram-negative organisms was more common in the IMI IV-treated patients who subsequently failed. Of 46 CIP/MTZ IV/PO patients (active oral arm), treatment success occurred in 96%, compared with 89% for those treated with CIP/MTZ IV and 89% for those receiving IMI IV. Patients who received intravenous/oral therapy were treated, overall, for an average of 8.6 +/- 3.6 days, with an average of 4.0 +/- 3.0 days of oral treatment. **CONCLUSIONS:** These results demonstrate statistical equivalence between CIP/MTZ IV and IMI IV in both the intent-to-treat and valid populations. Conversion to oral therapy with CIP/MTZ appears as effective as continued intravenous therapy in patients able to tolerate oral feedings.

Publication Types:

- Clinical Trial
- Multicenter Study
- Randomized Controlled Trial

PMID: 8604912 [PubMed - indexed for MEDLINE]

52: Arch Intern Med. 1995 Jun 26;155(12):1273-6.

[Related Articles, Links](#)

Comment in:

- [Arch Intern Med. 1996 Jun 10;156\(11\):1235.](#)

**Early switch from intravenous to oral cephalosporins in the treatment of hospitalized patients with community-acquired pneumonia.**

**Ramirez JA, Srinath L, Ahke S, Huang A, Raff MJ.**

Department of Medicine, University of Louisville (Ky) School of Medicine.

**BACKGROUND:** Switch therapy is defined as the early transition from intravenous to oral antibiotics during treatment of infection. This study was designed to evaluate the clinical outcome and length of stay of hospitalized patients with community-acquired pneumonia treated with an early switch from intravenous to oral third-generation cephalosporins. **METHODS:** Patients with a new roentgenographic pulmonary infiltrate and at least two symptoms (cough, fever, or leukocytosis) were enrolled in this study and treated with intravenous ceftizoxime sodium (1 g every 12 hours) or ceftriaxone sodium (1 g every 24 hours). Patients were switched to oral cefixime (400 mg every 24 hours) as soon as they met the following criteria: (1) resolution of fever; (2) improvement of cough and respiratory distress; (3) improvement of leukocytosis; and (4) presence of normal gastrointestinal tract absorption. **RESULTS:** Of the 120 patients enrolled, 75 (62%) had clinical data evaluated. Long-term follow-up showed that 74 patients (99%) were cured; one patient required readmission for further intravenous therapy. Mean duration of hospital stay was 4 days. **CONCLUSIONS:** This investigation demonstrated that an early switch to oral cefixime may be reasonable in hospitalized patients with community-acquired pneumonia who have already shown a good clinical and laboratory response to therapy with intravenous third-generation cephalosporins. This approach is clinically effective and minimizes hospital stay.

Publication Types:

- Clinical Trial
- Randomized Controlled Trial

PMID: 7778957 [PubMed - indexed for MEDLINE]



53: *Diagn Microbiol Infect Dis.* 1995 May-Jun;22(1-2):219-23.

[Related Articles, Links](#)

**Switch therapy in community-acquired pneumonia.**

**Ramirez JA.**

Division of Infectious Diseases, University of Louisville School of Medicine, KY 40292, USA.

In patients admitted to the hospital with community-acquired pneumonia, intravenous antimicrobials can be safely switched to oral administration when the patient shows evidence of early clinical improvement. In our institution, patients are switched to oral antibiotics when: (A) cough and respiratory distress are improving, (B) patient is afebrile for at least 8 h, (C) the white blood cell count is returning toward normal, and (D) there is no evidence of abnormal gastrointestinal absorption. Patients with respiratory infections of unknown etiology are switched to an oral antibiotic with the same spectrum of activity as the intravenous empiric antibiotic. Combining our prospective clinical studies, we have patient outcome data for more than 150 patients admitted to the hospital with community-acquired pneumonia, who were treated with switch therapy. The clinical cure rate was 99.3%. The total hospital savings for 1994 based on the 80 patients with community-acquired pneumonia who were treated with switch therapy was \$114,080. Discontinuation of intravenous lines will decrease the patient's risk for local cellulitis, abscess formation, septic thrombophlebitis, line sepsis, and endocarditis. The early hospital discharge associated with switch therapy will decrease the patient's risk for other nosocomial infections such as urinary or respiratory tract infections. Switch therapy is associated with a clinical cure rate that is equivalent to conventional therapy. In the area of cost-effective use of antibiotics, switch therapy should be considered as one of the primary options for health care cost containment.

PMID: 7587043 [PubMed - indexed for MEDLINE]



54: *Clin Ther.* 1995 May-Jun;17(3):534-40; discussion 516.

[Related Articles, Links](#)

**Pharmacist-managed intravenous to oral step-down program.**

**Hunter KA, Dormaier GK.**

Washington State University College of Pharmacy, Spokane, USA.

In an effort to provide cost-effective pharmaceutical care at a 650-bed community hospital, a pharmacist-managed intravenous to oral step-down program was developed and implemented. As part of this program, satellite pharmacists review daily the charts of patients receiving 1 or more of 10 targeted drugs given intravenously. Based on a predetermined set of criteria and their clinical judgment, pharmacists recommend that physicians switch to the oral formulation of the targeted drugs if appropriate. This program has been in place for 7 months, during which time 223 recommendations were made. Of these recommendations, 190 were accepted and implemented, resulting in a cost savings of \$21,596.00. When annualized, the expected savings is \$37,000.00 or nearly the salary of one full-time pharmacist. This program has been well accepted by physicians and pharmacists. It appears to be having a positive impact on physician awareness of using oral medications when appropriate.

PMID: 7585857 [PubMed - indexed for MEDLINE]



55: *J Fam Pract.* 1994 Oct;39(4):337-9.

[Related Articles, Links](#)

Comment in:

- [J Fam Pract. 1994 Oct;39\(4\):388-9.](#)

**The clinical utility of a day of hospital observation after switching from intravenous to oral antibiotic therapy in the treatment of pyelonephritis.**

**Caceres VM, Stange KC, Kikano GE, Zyzanski SJ.**

Family Practice Residency Program, University Hospitals of Cleveland, OH 44106.

**BACKGROUND.** This study was undertaken to investigate the clinical utility of a widespread practice: the 24-hour in-hospital observation period that commonly follows when the treatment of patients hospitalized with acute pyelonephritis is switched from intravenous to oral antibiotics. A preliminary survey of infectious disease specialists confirmed the pervasiveness of this practice and the lack of scientific evidence to support it. **METHODS.** The clinical utility of in-hospital observation was examined by means of a retrospective chart review of 138 consecutive nonpregnant adult patients who were between the ages of 17 and 65 and had been admitted to a university hospital with a diagnosis of acute pyelonephritis. The progress notes, temperature charts, and laboratory test results were reviewed for any evidence of clinical relapse or adverse reaction to the antibiotic that occurred in the 24-hour period after the switch from intravenous to oral antibiotic therapy. **RESULTS.** Only two (1%) patients had evidence of clinical relapse within the study period. Five (4%) patients had adverse reactions to their oral antibiotic, none of which were serious. The 95% confidence interval for the percentage of patients who might experience a clinical relapse was from 1% to 5%; for adverse antibiotic

reaction, 1% to 8%. CONCLUSIONS. This study shows the limited usefulness of an in-hospital observation period. Savings resulting from avoiding an extra day of hospitalization could amount to millions of dollars annually in the United States.

PMID: 7931111 [PubMed - indexed for MEDLINE]



56: Am J Hosp Pharm. 1994 Oct 1;51(19):2510.

[Related Articles, Links](#)

**Making the switch from i.v. to p.o.**

**Shepherd MF, Giese RM.**

Publication Types:

- Letter

PMID: 7847414 [PubMed - indexed for MEDLINE]



57: J Antimicrob Chemother. 1994 Jan;33(1):169-77.

[Related Articles, Links](#)

**Sequential therapy with intravenous and oral cephalosporins.**

**Janknegt R, van der Meer JW.**

Department of Clinical Pharmacy, Maasland Hospital Sittard, The Netherlands.

The pharmacokinetic, economic and practical aspects of sequential therapy with iv and oral cephalosporins are reviewed. New broad spectrum oral cephalosporins, such as cefixime, cefpodoxime proxetil and cefetamet pivoxil achieve serum concentrations above the MICs for most Enterobacteriaceae for at least as long as for parenteral cefuroxime. Substantial cost reductions are possible with an early switch from iv to oral cephalosporins. The clinical studies that have been performed so far have important shortcomings. Well designed clinical studies are necessary to prove the feasibility of sequential therapy with cephalosporins for serious infections in hospitalized patients.

Publication Types:

- Review
- Review, Tutorial

PMID: 8157558 [PubMed - indexed for MEDLINE]



58: Drugs. 1994;47 Suppl 3:43-51.

[Related Articles, Links](#)

**Parenteral-oral switch in the management of paediatric pneumonia.**

**Dagan R, Syrogiannopoulos G, Ashkenazi S, Engelhard D, Einhorn M, Gatzola-Karavelli M, Shalit I, Amir J.**

Pediatric Infectious Disease Unit, Soroka Medical Center, Beer-Sheva, Israel.

In phase I of a 2-phase study, 56 evaluable children (0.8 to 5 years) with lobar or segmental pneumonia received intravenous or intramuscular ceftriaxone 50 mg/kg/day for 2 days followed by oral cefetamet pivoxil 20 mg/kg/day in 2 divided doses to complete 7 days of treatment. All patients achieved a clinical cure. In phase II, a randomised open multicentre study, 62 children with pneumonia received an identical regimen to phase I (arm A), and 59 children received ceftriaxone 50 mg/kg/day for 1 day followed by 6 days' treatment with cefetamet pivoxil 20 mg/kg/day (arm B). Patients from phase I and arm A were combined giving a total of 118 evaluable patients in arm A. At the end of treatment, 100% of patients in arm A and 96% in arm B achieved a clinical cure; cure was maintained in 99 and 98% of patients, respectively. Two (4%) patients in arm B failed therapy; in both cases, factors other than treatment failure may have accounted for the poor response. 11 and 12% of patients in treatment arms A and B, respectively, experienced adverse events; gastrointestinal events (nausea and/or vomiting) were reported in 9 and 8% of patients, respectively. In conclusion, 1 or 2 days' treatment with parenteral ceftriaxone before switching to oral cefetamet pivoxil was safe and effective in the treatment of childhood pneumonia. Therefore, parenteral-oral switch is a feasible treatment option in the treatment of serious paediatric community-acquired pneumonia.

Publication Types:

- Clinical Trial
- Clinical Trial, Phase I
- Clinical Trial, Phase II

- Multicenter Study
- Randomized Controlled Trial

PMID: 7518766 [PubMed - indexed for MEDLINE]



59: Pharmacoeconomics. 1994;5(Suppl 2):20-6.

[Related Articles, Links](#)

**Cost-effectiveness and value of an IV switch.**

**Jewesson P.**

Vancouver General Hospital, Health Sciences Center and University of British Columbia, Canada.

A few antibiotics (i.e. metronidazole, clindamycin and ciprofloxacin) are available in both parenteral and oral formulations, and have good bioavailability, ensuring equivalent systemic drug concentrations. During a 4-year period subsequent to the initiation of a parenteral to oral (IV-PO) stepdown programme for metronidazole and clindamycin, Vancouver General Hospital saved approximately \$C85 000. However, many parenteral antibacterials lack an oral formulation, requiring oral stepdown to a different antibacterial with a similar spectrum of activity. Alternatively, the oral formulation of a parenteral antibacterial may have poor bioavailability (i.e. cefuroxime axetil, ampicillin, cloxacillin, erythromycin, and tetracycline) and it is not possible to maintain equivalent systemic drug concentrations. While rigid criteria are not applicable to all clinical scenarios, the general criteria for oral stepdown include the following: the patient 1) continues to need an antibiotic; 2) is clinically stable; 3) is capable of tolerating the oral dosage form; and 4) has no factors present (e.g. gastrointestinal abnormalities or drug interactions) that would adversely affect oral bioavailability. A review of subsequent IV-PO stepdown programmes at Vancouver General Hospital revealed that 1) not all patients receiving parenteral therapy are candidates for oral stepdown; 2) oral stepdown is delayed in a large proportion of treatment courses; 3) oral stepdown is not occurring in many patients for whom it is deemed appropriate; and 4) in a very few treatment courses stepdown may occur prematurely and may contribute to clinical deterioration.(ABSTRACT TRUNCATED AT 250 WORDS)

PMID: 10147285 [PubMed - indexed for MEDLINE]



60: Am J Med. 1991 Nov;91(5):462-70.

[Related Articles, Links](#)

**Clinical and economic evaluation of oral ciprofloxacin after an abbreviated course of intravenous antibiotics.**

**Paladino JA, Sperry HE, Backes JM, Gelber JA, Serriane DJ, Cumbo TJ, Schentag JJ.**

Clinical Pharmacokinetics Laboratory, Millard Fillmore Suburban Hospital, Williamsville, New York 14221.

PURPOSE: Oral ciprofloxacin has the requisite pharmacokinetic and antibacterial properties to rival the potency of intravenous antibiotics. This study was designed to determine whether oral ciprofloxacin could abbreviate the course of intravenous antibiotics in the treatment of serious infections. PATIENTS AND METHODS: Hospitalized adult patients were eligible for enrollment if they had a serious infection that was expected to require 8 or more days of intravenous antibiotic treatment. After conventional intravenous antibiotics were administered for 3 days, informed consent was obtained and patients were randomly assigned to either continue parenteral antibiotics (n = 53) or switch to oral ciprofloxacin 750 mg taken twice daily (n = 52). Ninety-nine of the 105 patients were evaluable for the assessment of efficacy. Clinical and bacteriologic efficacy, adverse events, and costs of the two treatments were compared. RESULTS: The two treatment groups were comparable for demographic characteristics, types of infections, bacteria isolated, initial intravenous antibiotic regimens, and duration of antibiotic treatment. The most common infections were of the skin and skin structure; bacteremia and infections of the lower respiratory tract, urinary tract, and bone and joint were also represented. The most commonly isolated pathogens were Staphylococcus aureus, Pseudomonas aeruginosa, and Escherichia coli. The most frequently prescribed intravenous antibiotics before randomization included aminoglycosides, cephalosporins, vancomycin, and nafcillin; 52 evaluable patients were treated with combination therapy while 47 received monotherapy. The clinical and bacteriologic outcomes and adverse reaction frequency with oral ciprofloxacin were comparable to those of the continued intravenous antibiotic regimens. Ciprofloxacin was associated with an average cost savings of \$293 per patient. CONCLUSION: When used after 3 days of intravenous antibiotics, oral ciprofloxacin was as safe and effective as full courses of intravenous antibiotics and provided substantial cost savings.

Publication Types:

- Clinical Trial
- Randomized Controlled Trial

PMID: 1951408 [PubMed - indexed for MEDLINE]



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**Antibiotic treatment of tuboovarian abscess: comparison of broad-spectrum beta-lactam agents versus clindamycin-containing regimens.**

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One hundred nineteen patients with tuboovarian abscess were evaluated for response to antibiotics. Results were stratified into three groups by antimicrobial regimen. Group 1 consisted of 37 patients treated with a single-agent broad-spectrum intravenous antibiotic and oral doxycycline. Initial clinical response (defined as decreased pain, diminished white blood cell count, or defervescence) in group 1 was 31/37 (84%). Group 2 consisted of 64 patients treated with clindamycin in combination with an aminoglycoside with or without a penicillin. There was an initial clinical response in 45 of 64 (70%). Group 3 consisted of 18 patients from group 1 who were changed to a clindamycin-containing regimen after 2 to 3 days of initial treatment with a single-agent broad-spectrum antibiotic. The decision to switch antibiotics was not based on treatment failure but occurred when delayed ultrasonography confirmed the diagnosis of tuboovarian abscess. The switch reflected physician preference for clindamycin-containing regimens in the treatment of tuboovarian abscesses. The response rate in this subset of patients was 14 of 18 (78%). Overall initial clinical response rate was 90 of 119 (75%). There were no statistically significant demographic or clinical differences among the three groups. There was no statistical difference in the rate of early and late antibiotic failure rates among the groups. Our study demonstrates that extended-spectrum antibiotic coverage, including single-agent broad-spectrum antibiotics such as cefoxitin, in conjunction with doxycycline has efficacy that is equivalent to that of clindamycin-containing regimens. An overall medical treatment success rate of 75% suggests that conservative treatment of tuboovarian abscesses is warranted.

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