

Early Switch and Early Discharge Strategies in Patients With Community-Acquired Pneumonia

A Meta-analysis

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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.

Arch Intern Med. 2001;161:722-727

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COMMUNITY-acquired pneumonia (CAP) is responsible for approximately 500 000 hospitalizations in the United States each year.¹ The total annual cost of treating patients with CAP is approximately \$9.7 billion, and the primary determinant of cost is length of stay (LOS) in the hospital.² The duration of parenteral antibiotic therapy is often the primary factor affecting LOS for patients with CAP.³ In addition, economic pressures facing hospitals have resulted in a shortened LOS and in increased interest in switching patients from parenteral to oral antibiotics earlier than usual treatment and discharging them from the hospital. Findings from the Pneumonia Patient Outcomes Research Team suggest that while the mean LOS varies among hospitals, clinical outcomes are no worse for patients with a shorter LOS compared with patients who are hospitalized longer.⁴

Since duration of parenteral antibiotic therapy is often the primary factor determining LOS in the hospital, strategies to achieve early switch from parenteral to oral antibiotics and early discharge for patients with CAP are implemented by various institutions in an attempt to improve the efficiency of care. Several studies have evaluated early switch and early discharge strategies. For example, a recent study by Ramirez et al³ demonstrated that up to 44% of hospitalized patients may be treated with early switch and early discharge strategies, and that application of these strategies nationwide could result in annual savings of approximately \$400 million. However, studies vary in their designs, criteria for switch and discharge, and results. Furthermore, it remains unclear (1) when a patient can be switched or discharged, (2) how effective early switch and early discharge strategies are in reducing LOS, and (3) how these strategies affect patient outcomes. Hence, there is a need

MATERIALS AND METHODS

We searched the MEDLINE, HEALTHSTAR, EMBASE, Cochrane Collaboration, and Best Evidence databases for prospective trials, retrospective trials, meta-analyses, and systematic reviews addressing early switch from parenteral to oral antibiotics and early discharge in patients with CAP. The following medical subject headings were searched: pneumonia, respiratory tract infections, community-acquired infections, infection, guidelines, economics, meta-analysis, prospective studies, randomized controlled trials, controlled clinical trials, treatment outcome, treatment failure, hospitalization, antibiotics, patient discharge, length of stay, quality of health care, outcome and process assessment (health care), quality assurance (health care), and total quality management. In addition, a literature search was performed based on the following title words: switch, conversion, intravenous to oral, parenteral to oral, community-acquired, pathway, guideline, quality, outcome, and discharge. A study was defined as having an *early switch and early discharge strategy* if it described a method or intervention designed to shorten LOS by recommending early switch, early discharge, or both from the hospital. The search was limited to English-language articles published between January 1, 1980, and March 31, 2000, human subjects, and clinical trials. Exclusion criteria applied to articles included the following: (1) a less rigorous study design (a retrospective or noninterventive study, review article [unless specifically addressing early switch from parenteral to oral antibiotics, early discharge, or both]; a letter; an editorial; a case study; a decision analysis; a consensus statement; a highlight from a conference; or an abstract); (2) a specific patient population (not specific for CAP, outpatient, aged <18 years, infected with the human immunodeficiency virus, has the acquired immunodeficiency virus syndrome, underwent transplantation, or has cystic fibrosis); (3) a nonbacterial cause (mycobacterial, fungal, or viral); (4) a nonclinical evaluation (in vitro activity, pharmacological features, or cytokines); (5) the study primarily addresses an issue not related to early switch from parenteral to oral antibiotics, early discharge, or both (no LOS evaluation, cause, epidemiological features, specific pathogen, admission decision, diagnosis or diagnostic workup, adverse drug reactions, antibiotic resistance, complications, or prevention); or (6) absence of criteria for switch, recommended day of switch, or recommended minimum number of days of parenteral treatment.

After exclusion, the remaining articles were evaluated for switch criteria, discharge criteria, and outcomes. Articles were eligible for switch criteria evaluation if they described specific clinical requirements for switching from parenteral to oral antibiotics. Articles were eligible for discharge criteria evaluation if they were eligible for switch criteria evaluation and described additional requirements for discharging the patient from the hospital. When switch and discharge criteria overlapped within a study, criteria were listed once as part of the switch criteria. Only studies that evaluated LOS were eligible for the outcomes evaluation. Furthermore, studies that compared parallel groups with different recommended days of parenteral and oral therapy were included if the intervention that recommended the shortest time to starting an oral antibiotic also involved a switch from parenteral to oral antibiotics (ie, articles in which oral antibiotics were started on day 1 without a switch were excluded). Outcomes studies were classified as being prospectively controlled vs uncontrolled or having a historical control group. A study was considered to be controlled if it fulfilled the following criteria: (1) the control group was identified at the start of the study and (2) LOS was compared in 2 or more groups. Finally, we reviewed the bibliographies of all selected articles and surveyed local experts in infectious disease, pulmonary and critical care, and health services research to identify additional studies.

QUALITY CONTROL

The process of selecting articles occurred in 3 predefined stages: (1) title review, (2) abstract review, and (3) article review. Two reviewers (D.C.R. and G.S.T.) independently selected titles, and an all-inclusive list of titles was compiled. After the second and third stage of the review process, all articles were independently reviewed, with interrater agreement assessed by κ value.

STATISTICAL METHODS

χ^2 Analysis demonstrated significant ($P = .000000019$) variability between differences in LOS between studies. Therefore, to combine the difference in LOS for each study, we performed a random-effects meta-analysis⁵ using a software program (FAST* PRO⁶). $P < .05$ was considered statistically significant. Furthermore, κ values for agreement were calculated using the methods described by Fleiss.⁷

to synthesize the existing data to provide practical guidance for clinicians. Therefore, we conducted a meta-analysis of the medical literature to appraise the impact of early switch and early discharge strategies in the management of CAP. The goals of our study were to (1) evaluate the various criteria used in studies for early switch to determine which have been shown to be safe in scientific studies and (2) assess the impact of early switch and early discharge strategies on clinical outcomes and LOS.

RESULTS

Our initial search yielded 1794 titles, from which 266 abstracts were reviewed. Most articles were excluded be-

cause they evaluated patients without CAP or addressed a topic that was not related to early switch from parenteral to oral antibiotics or early discharge. One hundred twenty-one articles were then selected and reviewed. The κ values from the abstract and article reviews were 0.80 and 0.65, respectively. We identified 10 studies^{3,8-16} that applied early switch and early discharge criteria to a population of patients with CAP in a prospective interventional trial (**Figure**).

CRITERIA FOR SWITCH

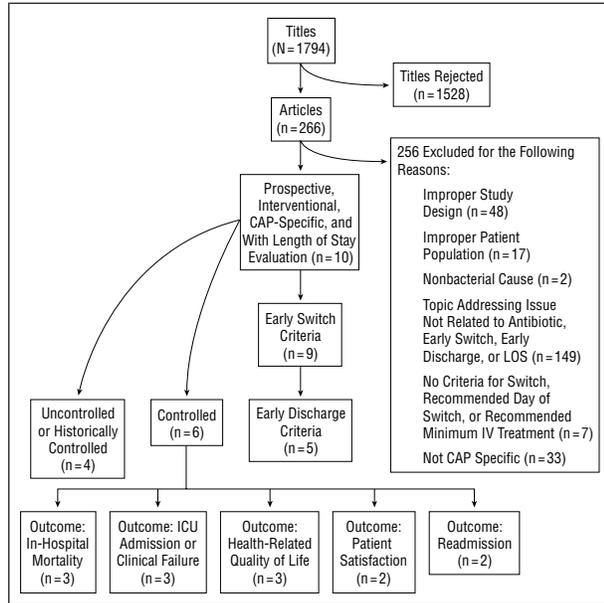
Nine studies^{3,8-15} applied early switch criteria (reviewer κ , 1.0) (**Table 1**). The most common criteria were afebrile (100%), improvement or resolution of respiratory

signs and symptoms (89%), and able to take oral antibiotics (67%). *Afebrile*—the only criterion included in every study—was defined in several different ways: 4 studies used the term *afebrile* or normal temperature,^{9,12,14,15} 1 described a temperature of 100°F or less ($\leq 37.8^{\circ}\text{C}$),¹³ 1 described a temperature of 38°C or less,⁸ and 1 described a temperature less than 38°C or 100.4°F.¹⁰ Three studies by Ramirez and colleagues^{3,9,14} applied the same switch criteria; also, one study each by Rhew¹¹ and Weingarten¹³ and colleagues applied the same switch criteria. In total, 6 different criteria for switching were applied in the 9 studies. Furthermore, a specific postswitch antibiotic was recommended in 4 of the 9, a specific day for switching (median, day 3) in 5 of the 9, and a spe-

cific day for discharge (median, day 4) in 4 of the 9 studies that applied early switch criteria.

CRITERIA FOR DISCHARGE

Five of the studies^{3,8,11,13,14} that applied early switch criteria also applied separate criteria for early discharge (reviewer κ , 1.0) (**Table 2**). The most common criterion for early discharge was care of comorbid conditions (eg, no unstable comorbid conditions or congestive heart failure). There was an even greater lack of commonality among discharge criteria vs switch criteria, with 4 different discharge criteria combinations applied in the 5 studies.



The article selection process. CAP indicates community-acquired pneumonia; LOS, length of stay; IV, intravenous; and ICU, intensive care unit.

SWITCH ON SPECIFIC DAY OR MINIMUM PARENTERAL TREATMENT

Three CAP-specific prospective interventional studies^{11,13,16} recommended switching to an oral antibiotic on a specific day (**Table 3**). The median recommended day of switch was day 3 (range, 2-10 days). Five articles^{10,11,13,15,16} recommended switching to an oral antibiotic after a minimum number of days of parenteral therapy. The median recommended duration of parenteral antibiotics was 3 days (range, 2-10 days).

OUTCOMES

All 10 CAP-specific prospective interventional studies^{3,8-16} met inclusion criteria for outcomes evaluation. Eight studies^{8-11,13-16} provided mean age data for 2463 patients; the mean age in these studies was 61 years. However, although the study by Marrie and colleagues⁸ accounted for approximately 80% of the total number of patients, the comparison groups in this study were sites instead of patients. Age data were not provided for 1236 patients in 2 studies.^{3,12}

Table 1. Criteria for Early Switch From Parenteral to Oral Antibiotics for Patients With Community-Acquired Pneumonia*

Source, y	Early Switch Criteria								
	No Fever	Improvement or Resolution of Respiratory Tract Signs and Symptoms	Able to Take Oral Antibiotics	Normal or Normalizing WBC Count	Hemodynamic Stability†	"Clinically Stable" or "No Unstable Comorbid Diseases"‡	No Other Sites of Infection‡	Improving or Stable Chest Radiograph	No Short-term Mental Status Change
Marrie et al, ⁸ 2000	X	X	X	...	X	...	X	...	...
Ramirez et al, ³ 1999	X	X	X	X	...	...	...	...	...
Ramirez, ⁹ 1998	X	X	X	X	...	...	...	...	...
Omidvari et al, ¹⁰ 1998	X	X	...	...	...	...	...	X	...
Rhew et al, ¹¹ 1998	X	X	X	...	X	X	X	...	X
Ross et al, ¹² 1997§	X	X	...	...	...	X	...	X	...
Weingarten et al, ¹³ 1996	X	X	X	...	X	X	X	...	X
Ramirez et al, ¹⁴ 1995	X	X	X	X	...	...	...	...	...
Hendrickson and North, ¹⁵ 1995	X	...	...	X	X	X	...	...	...
Total	9 (100%)	8 (89%)	6 (67%)	4 (44%)	4 (44%)	4 (44%)	3 (33%)	2 (22%)	2 (22%)

*X indicates the criterion is present; WBC, white blood cells; and ellipses, data not applicable.

†For example, absence of hypotension, tachycardia, or dehydration with hypernatremia.

‡Or negative blood culture results.

§An early switch and early discharge intervention is a component of a clinical pathway. Listed as discharge criteria in the study, but applied as switch criteria (see definition of switch criteria in the "Materials and Methods" section).

Table 2. Criteria for Early Discharge for Patients With Community-Acquired Pneumonia*

Source, y	Early Discharge Criteria†						Recommend Day of Switch From Parenteral to Oral Antibiotics	Type of Oral Antibiotic	Recommend Day of Discharge
	Care of Comorbid Disease (1)	Need for Diagnostic Workup (2)	Social Needs (3)	Stable After Observation (4)	Normal WBC Count (5)	Normal Oxygenation (6)			
Marrie et al, ⁸ 2000	X	...	...	...	X	X	...	S	...
Ramirez et al, ³ 1999	X	X	X	...	...	...	3	A	3
Rhew et al, ¹¹ 1998	X	...	...	...	...	...	3	A	4
Weingarten et al, ¹³ 1996	X	...	...	...	...	...	3	A	4
Ramirez et al, ¹⁴ 1995	...	...	...	X	...	...	After criteria were met	S	After 1 d of observation
Total	4 (80%)	1 (20%)	1 (20%)	1 (20%)	1 (20%)	1 (20%)	...	...	...

*WBC indicates white blood cell; X, the criterion is present; S, specified; A, any; and ellipses, data not applicable.

†Examples of some of the early discharge criteria are as follows: 1, care of congestive heart failure; 2, need for bronchoscopy for a lung mass; 3, an unstable home situation; 5, $\leq 12 \times 10^9/L$; and 6, oxygen saturation $>90\%$ with room air (for patients with chronic obstructive pulmonary disease, $Po_2 >60$ mm Hg and $Pco_2 <45$ mm Hg).

Six studies^{8,10,11,13,15,16} applied an early switch and early discharge strategy to an intervention and control group (Table 4), and 5 of these studies^{8,10,11,13,16} provided SD values for LOS. The mean change in LOS was not significantly ($P=.05$) reduced based on the random-effects model (-1.64 days; 95% confidence interval, -3.30 to 0.02 days). The studies by Rhew¹¹ and Weingarten¹³ and colleagues recommended an intervention LOS that was longer than or equal to the control LOS. When these 2 studies were excluded from the analysis, the mean change in LOS was 3 days (-3.04 days; 95% confidence interval, -4.90 to -1.19 days) (Table 4).

The following clinical outcomes were compared between the intervention and control groups: complications or therapeutic failures (4 studies^{8,10,13,16}), mortality (3 studies^{8,10,13}), readmission (3 studies^{8,11,13}), health-related quality of life (3 studies^{8,11,13}), therapeutic success (2 studies^{10,16}), patient satisfaction with care (2 studies^{11,13}), intensive care unit admission (1 study⁸), any adverse outcome (1 study⁸), and relapse (1 study¹⁰). Studies did not reveal significant differences between the intervention and control groups for any of these clinical outcomes. Characteristics of studies that may have confounded the LOS analysis are detailed in Table 5. In general, there did not appear to be a major confounding factor affecting the evaluation of LOS, such as disproportionately high dropout rates in the intervention groups, high mortality rates, or high readmission rates.

In addition, we identified 4 studies^{3,9,12,14} ($n=985$) that applied an early switch and early discharge intervention to a population of patients with CAP and that had no control group or a historical control group (Table 6). In the 3 uncontrolled studies,^{3,9,12} the comparison group consisted of patients who did not receive the intervention despite being assigned at the start of the study to receive it. The other study¹⁴ used a historical control group. Early switch strategies were applied to 710 (72%) of the patients in these 4 studies with a historical control or no control group. Where data were available, the mean time to switch and the mean LOS in patients receiving the intervention appeared to be less than the values observed for control patients.

Table 3. Studies That Recommend Switching From a Parenteral to an Oral Antibiotic on a Specific Day or After a Minimum Number of Days of Parenteral Treatment for Patients With Community-Acquired Pneumonia

Source, y	Recommended Day of Switch From a Parenteral to an Oral Antibiotic	Recommended Minimum No. of Days of Parenteral Treatment
Omidvari et al, ¹⁰ 1998	Not available	2
Rhew et al, ¹¹ 1998	3	3
Siegel et al, ¹⁶ 1996	2, 5, and 10*	2, 5, and 10*
Weingarten et al, ¹³ 1996	3	3
Hendrickson and North, ¹⁵ 1995	Not available	2

*Three intervention arms: (1) recommend switch on day 2, (2) recommend switch on day 5, and (3) maintain parenteral therapy for 10 days without switching to an oral agent.

COMMENT

To our knowledge, this study represents the first meta-analysis of the literature to evaluate early switch from parenteral to oral antibiotics and early discharge strategies in patients with CAP. Our review demonstrates that there is considerable variability in early switch and early discharge criteria that promotes uncertainty regarding the interpretation of outcomes. Moreover, the results of this meta-analysis demonstrate that, although implementing early switch criteria is safe, effectiveness in reducing LOS is dependent on proper assessment of baseline LOS.

Lengths of stay in the 6 prospectively controlled trials^{8,10,11,13,15,16} are quite variable (range, 3.5-11 days). This may suggest that the patients in these trials are not similar and that pooled analysis should not have been performed on these data. However, in the 5 trials^{8,10,11,13,16} in which meta-analysis is performed, all patients are diagnosed as having CAP and the mean age is similar (range, 56-69.6 years). Two studies^{11,13} enroll "low-risk" patients who do not have an obvious reason for continued

Table 4. Features of Prospective Interventional Controlled Trials

Source, y	Intervention Group		Control Group		δ Length of Stay, d*
	No. of Subjects	Length of Stay, d*	No. of Subjects	Length of Stay, d*	
Marrie et al, ⁸ 2000	9†	8.2 (8.1 to 8.3)	10†	9.6 (9.5 to 9.7)	-1.4 (-3.35 to 0.55)
Rhew et al, ¹¹ 1998	67	3.6 (3.5 to 3.7)	85	3.5 (3.4 to 3.6)	0.1 (-0.87 to 1.07)
Omidvari et al, ¹⁰ 1998	58	7.3 (7.1 to 7.5)	37	9.7 (9.4 to 10)	-2.4 (-4.85 to 0.05)
Siegel et al, ¹⁶ 1996‡	16	6.0 (4.4 to 7.6)	15	11.0 (10.5 to 11.6)	-5.0 (-6.67 to -3.33)
	15	8.0 (6.9 to 9.1)	...	...	...
Weingarten et al, ¹³ 1996	68	4.0 (3.6 to 4.4)	78	4.2 (3.9 to 4.5)	-0.2 (-0.67 to 0.27)
Hendrickson and North, ¹⁵ 1995§	16	4.8	15	6.0	-1.2
Pooled	249	6.0 (4.4 to 7.7)	240	7.6 (4.9 to 10.3)	-1.64 (-3.30 to 0.02)
					Without the studies by Rhew ¹¹ and Weingarten and colleagues ¹³ : -3.04 (-4.90 to -1.19)||

*Data are given as the mean (95% confidence interval).

†Length of stay comparison was made between 9 intervention sites (716 patients) and 10 control sites (1027 patients). Other studies compared length of stay at the patient level.

‡Ellipses indicate data not applicable.

§This article was excluded from meta-analysis because the SD or 95% confidence intervals were not provided in the study.

||The studies by Rhew¹¹ and Weingarten¹³ and colleagues recommended an intervention length of stay that was longer than or equal to the control length of stay.

Table 5. Characteristics of Prospective Interventional Controlled Trials That May Confound Length-of-Stay Analysis*

Source, y	Outcome				Subjects Lost to Follow-up or Excluded Due to Protocol Violation (Based on ITT)‡
	Death	Complications†	Readmissions	Intolerance to the Oral Antibiotic	
Marrie et al, ⁸ 2000	I, 2.4%; and C, 2.5%	I, 4.6%; and C, 4.0%	I, 3.6%; and C, 2.9%	NA	5% (1/20) of hospital (from I)
Rhew et al, ¹¹ 1998	NA	NA	I, 7.7%; and C, 8.5%	NA	37% (90/242)
Omidvari et al, ¹⁰ 1998	NA (5 deaths occurred after hospitalization; deaths were related to underlying disease)	"Similar" rate between the patients in the I and C groups who were hospitalized >10 d	NA	I, 1/58 (2%); and C, 1/37 (3%)	30% (40/135) (majority from C)
Siegel et al, ¹⁶ 1996	NA	4 patients (7%): I1, 1; I2, 2; and C, 1	NA	NA	24% (18/75)
Weingarten et al, ¹³ 1996	I, 0%; and C, 0% (95% CI, 0%-25%)	4 patients (2.7%) (none life threatening)	Total, 4.1% (95% CI, 1.3%-9.2%)	NA	32% not able to be contacted 1 mo after discharge; 1-mo survival status not available for 0.7%
Hendrickson and North, ¹⁵ 1995	NA	NA	NA	NA	0% (0/31)

*ITT indicates intention-to-treat analysis; I, intervention group; C, control group; NA, not addressed; I1, intervention 1; I2, intervention 2; and CI, confidence interval.

†Complications experienced during hospitalization may include respiratory tract failure, systemic sepsis, empyema, new onset of congestive heart failure, atrial fibrillation, stroke, pulmonary infarction, myocardial infarction, or necrotizing pneumonia.

‡A protocol violation includes signing out of the hospital against medical advice.

hospitalization on the third hospital day, and these patients demonstrated a relatively short baseline mean LOS (3.5 and 4.2 days, respectively) that is shorter than that recommended by the guideline. When these 2 studies are excluded from the analysis, the mean change in LOS is reduced by 3 days. The potential impact of including these 2 studies with low-risk patients in the meta-analysis, however, is that it may have been more difficult to demonstrate a significant reduction in LOS with the intervention, thus resulting in a more conservative estimate of the effect of early switch and early discharge.

It is likely that other factors, such as secular trends and geography, may have contributed to the variation in LOS between studies. Length of stay has been declining over time; yet, for the study by Marrie and col-

leagues⁸ (the most recent study in this meta-analysis), the mean LOSs in the intervention and control groups are 8.2 and 9.6 days, respectively. These LOSs are twice the mean LOS in the studies by Rhew¹¹ and Weingarten¹³ and colleagues. In our present study, regional differences may also explain the variability in LOS. The study by Marrie et al was conducted in Canada, whereas the other studies were conducted in the United States. Moreover, the study by Marrie et al is 1 of 2 trials^{8,12} applying early switch and early discharge as one component of a clinical pathway. It is possible that the results in these trials may not be reproducible when these criteria are extracted from a pathway. On the other hand, the other components in the pathway do not specifically focus on reducing LOS and are unlikely to have directly promoted an early discharge.

Table 6. Features of Prospective Uncontrolled or Historically Controlled Studies*

Source, y	Intervention Group			Comparison Group		
	No. of Subjects	Time to Switch, Mean, d	Length of Stay, d†	No. of Subjects	Time to Switch, Mean, d	Length of Stay, d†
Ramirez et al, ³ 1999	133‡	3.00	4.80‡	67	NA	NA
Ramirez, ⁹ 1998	74	2.50	NA	27	6.00	NA
Ross et al, ¹² 1997§	123	NA	7.98 ± 5.68	44	NA	8.83 ± 7.56
	305	NA	7.98 ± 6.54	92	NA	10.26 ± 6.96
Ramirez et al, ¹⁴ 1995	75	2.98	4.00	45	NA	6.00||

*The total number of subjects in the intervention group was 710; and in the comparison group, 275. NA indicates data not available.

†Data are given as the mean ± SE.

‡In this study, 118 of the 133 patients underwent early switch from parenteral to oral antibiotics and early discharge, while 45 underwent early switch from parenteral to oral antibiotics and no early discharge. The mean length of stay of those undergoing early switch from parenteral to oral antibiotics and early discharge was 3.4 days; and of those undergoing early switch from parenteral to oral antibiotics and no early discharge, 7.6 days.

§Applied the intervention during 3 separate periods (August 1993 to April 1994, June to December 1994, and February to December 1995). Data from only the latter 2 periods are provided because the first period is missing data regarding number of patients.

||Historical control.

Our findings are relevant to clinicians and future investigators in several ways. First, although there is much variability in criteria, some features of early switch and early discharge are applied commonly. For instance, resolution of fever, improving respiratory signs and/or symptoms, and the ability to take oral medications are common criteria for early switch, whereas care of comorbid conditions is a common criterion for early discharge. Clinicians should ensure that, at a minimum, these criteria be included as part of an early switch and early discharge strategy. Second, these data demonstrate that early switch and early discharge strategies may or may not reduce LOS. A critical factor to the success of a strategy involves assessing whether the baseline LOS is longer than that recommended by the guideline. Rhew¹¹ and Weingarten¹³ and colleagues attribute their reversed LOSs to changing practice patterns, and comment that LOS should be assessed immediately before the implementation of the guideline. Third, studies that evaluate the effect of early switch and early discharge demonstrate considerable variability in their designs. Nearly half of the trials are uncontrolled or use a historical control group. These types of analyses potentiate the bias of comparison group patients having longer LOSs because of temporal changes in practice patterns or other unmeasured effects.

Having identified so much variation in the application of early switch and early discharge criteria, we believe that there is a need for continued research and for consensus on a standard minimum set. Despite this variability, however, we believe that early switch and early discharge strategies may significantly and safely reduce the mean LOS when the recommended LOS is shorter than the actual LOS. Further prospectively controlled interventional studies with baseline LOS assessments are needed to verify these findings.

Accepted for publication September 21, 2000.

Presented in part at the International Society for Pharmacoeconomics and Outcomes Research (ISPOR) Fifth Annual International Meeting, Washington, DC, May 23, 2000.

We thank Victor Hasselblad, PhD, for his assistance with the statistical analyses performed.

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