

UNIVERSITY OF UTAH COLLEGE OF PHARMACY

FINAL READING APPROVAL

TO THE DOCTOR OF PHARMACY COMMITTEE OF THE UNIVERSITY OF UTAH COLLEGE OF PHARMACY:

EFFECTS OF A DRUG UTILIZATION REVIEW ON PRESCRIBING

I have read the clinical research project report of Dwight Keith Perkins in its ANTIBIOTIC PROPHYLAXIS FOR CESAREAN DELIVERIES, citations, and Bibliographic style are consistent and acceptable; 2) its illustrative materials including figures, tables, and charts are in place; and 3) the final manuscript is satisfactory to the Supervisory Committee and is ready for submission to the Doctor of Pharmacy Committee.

by

Dwight Keith Perkins

7/19/84  
Date

Thomas W. Ludds  
Chairman, Supervisory Committee

A project submitted to the faculty of the University of Utah in partial fulfillment of the requirements for the degree of

Approved for the Department of Pharmacy Practice

Robert Thompson

Doctor of Pharmacy

Approved for the Doctor of Pharmacy Committee

College of Pharmacy

University of Utah

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UNIVERSITY OF UTAH COLLEGE OF PHARMACY

UNIVERSITY FINAL READING APPROVAL PHARMACY

TO THE DOCTOR OF PHARMACY COMMITTEE OF THE UNIVERSITY OF UTAH COLLEGE OF PHARMACY:

I have read the clinical research project report of Dwight Keith Perkins in its final form and have found that 1) its format, citations, and bibliographic style are consistent and acceptable; 2) its illustrative materials including figures, tables, and charts are in place; and 3) the final manuscript is satisfactory to the Supervisory Committee and is ready for submission to the Doctor of Pharmacy Committee.

We, the undersigned, have read this clinical research project report and have found it to be of satisfactory quality for a Doctor of Pharmacy Degree.

7/19/84  
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INTRODUCTION

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The ability of America's medical care system to identify and correct inefficiency and waste is essential if this nation is to enjoy its present high standard of health care. Drug utilization review (DUR) Program is an authorized, structured, systematic program that reviews, analyzes, and intervenes on inappropriate drug usage in health care delivery systems against predetermined criteria. The program identifies areas of excessive drug therapy and describes strategies aimed at correcting deficiencies in an effort to improve the quality of patient care attainable. Thus, Drug Utilization Review Program is a quality assurance program for drug therapy. The Joint Commission on Accreditation of Hospitals requires that hospitals conduct Drug Utilization Reviews to maintain accreditation. A DUR involves the development of criteria of appropriate drug usage for a specific indication against which the current use of a drug is evaluated. The criteria are based on current literature and the clinical expertise of the medical staff and may address justification for use, process or outcome issues.

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Drug Utilization Review Program is a quality assurance program for drug therapy. The Joint Commission on Accreditation of Hospitals requires that hospitals conduct Drug Utilization Reviews to maintain accreditation. A DUR involves the development of criteria of appropriate drug usage for a specific indication against which the current use of a drug is evaluated. The criteria are based on current literature and the clinical expertise of the medical staff and may address justification for use, process or outcome issues.

Knapp et al<sup>1</sup> have published guidelines for the development and

system of criteria classification. The PSRO Council defines criteria as predetermined elements against which aspects of the quality of a medical service may be compared. They are developed by professionals

INTRODUCTION

Relying on professional expertise and on the professional literature.

The ability of America's medical care system to identify and eliminate inefficiency and waste is essential if this nation is to continue to enjoy its present high standard of health care. Drug use

Antibiotic use has been identified as an area with frequent overuse and abuse. Estimates indicate 30 to 40 percent of hospitalized patients receive an antibiotic sometime during their hospital stay and antibiotics account for 25 to 35 percent of this country's expenditure for ethical pharmaceuticals. Tobi and Schuna found review is a control mechanism which represents one approach to the problem of assuring the quality and economy of the drug use process.<sup>1</sup>

A Drug Utilization Review (DUR) Program is an authorized, structured, and on-going program that reviews, analyzes and interprets patterns of drug usage in health care delivery systems against predetermined standards. The program identifies areas of suboptimal drug therapy

misguided prophylactic accounts for over one-half of the inappropriate antibiotic therapy in their hospitals. Caspiro et al reported that to maintain the highest quality of patient care attainable. Thus, a Drug Utilization Review Program is a quality assurance program for Pennsylvania were administered for more than two days.

Methods employed to decrease inappropriate use of antibiotics requires that hospitals conduct Drug Utilization Reviews to maintain accreditation. A DUR involves the development of criteria of appropriate prescription system. Durbin et al investigated the use of a system

of a drug is evaluated. The criteria are based on current literature prophylactic, empiric or therapeutic. Prophylactic antibiotics were and the clinical expertise of the medical staff and may address automatically discontinued after two days. The investigators found justification for use, process or outcome issues.

statistically significant reductions in the percentage of patients Knapp et al<sup>1</sup> have published guidelines for the development and receiving prophylactic antibiotics and in the mean duration of such application of criteria in drug use review programs. The authors prophylaxis after introduction of the system.

present and discuss the definition of terms used by the Professional Standards Review Organization (PSRO) pertaining to DURs and present a to improve antibiotic prescribing and have shown that face-to-face

system of criteria classification. The PSRO Council defines criteria as predetermined elements against which aspects of the quality of a medical service may be compared. They are developed by professionals relying on professional expertise and on the professional literature.

Antibiotic use has been identified as an area with frequent overuse and misuse.<sup>2,3</sup> Estimates indicate 30 to 40 percent of hospitalized patients receive an antibiotic sometime during their hospital stay<sup>4,5</sup> and antibiotics account for 25 to 35 percent of this country's expenditure for ethical pharmaceuticals.<sup>3,5</sup> Maki and Schuna found antibiotics used for surgical prophylaxis less likely to be appropriate (47 percent appropriate) than therapy given for presumed infection (65 percent appropriate).<sup>3</sup> Other investigators have found that misguided prophylaxis accounts for over one-half of the inappropriate antibiotic therapy in their hospitals.<sup>6</sup> Shapiro et al<sup>4</sup> reported that 74 percent of prophylactic drugs used in the general hospitals of Pennsylvania were administered for more than two days.  $p < 0.001$  were

Methods employed to decrease inappropriate use of antibiotics include formulary restriction, educational programs, and a novel prescription system. Durbin et al<sup>7</sup> investigated the use of a system in which the physicians were required to categorize antibiotic use as prophylactic, empiric or therapeutic. Prophylactic antibiotics were automatically discontinued after two days. The investigators found statistically significant reductions in the percentage of patients receiving prophylactic antibiotics and in the mean duration of such prophylaxis after introduction of the system.  $p < 0.001$  were

Other investigators have compared educational programs designed to improve antibiotic prescribing and have shown that face-to-face

communication with practitioners is significantly more effective in bringing about behavior changes than providing printed material alone. Avorn and Soumerai<sup>8</sup> compared changes in prescribing patterns of randomly assigned physicians who were offered personal educational visits by clinical pharmacists along with a series of mailed "unadvertisements" to physicians receiving mailed print materials only. A statistically significant ( $p = 0.0006$ ) reduction in the number of prescriptions for cephalexin and other target drugs was observed in the group receiving face-to-face communication. Schaffner et al<sup>9</sup> found similar changes in antibiotic prescribing when they compared a personal visit by a physician to a mailed brochure. Johnson et al<sup>10</sup> instituted an educational program to improve gentamicin prescribing patterns of physicians directed primarily at the medical and surgical housestaff. In the preeducational review period, 57 of 109 courses of gentamicin (52 percent) were found acceptable. Following the educational program, 93 of 120 courses (78 percent;  $p < 0.001$ ) were acceptable.

A screening audit conducted in the summer of 1983 of patients undergoing cesarean delivery at the University of Utah Hospital revealed the antibiotic prophylaxis being employed included various drugs and various durations, some extending greater than two days. This study presents the literature used to develop DUR criteria for appropriate prophylaxis of non-elective cesarean delivery, the results of the DUR and the effects on subsequent prophylactic courses after presenting the literature review used in criteria development and the findings of the DUR to the Obstetrics and Gynecology (OB-GYN) housestaff and faculty.

OBJECTIVES

1. Develop criteria for appropriate antibiotic prophylaxis for cesarean sections.
2. Conduct a Drug Utilization Review of antibiotic prophylaxis for cesarean deliveries at the University of Utah Hospital during the first six months of 1983.
3. Present findings of the DUR and a review of supporting literature to OB-GYN housestaff.
4. Conduct a subsequent DUR to evaluate the effects of the presentation on antibiotic prophylaxis.
5. Recommend additional measures if indicated to increase the incidence of appropriate antibiotic prophylaxis for cesarean section.

DEVELOPMENT OF CRITERIA

In developing criteria for a specific indication the following questions must be answered: Is any drug effective for the specific indication? Is any drug or combination of drugs more effective than others? What is the optimal length of drug administration? Is drug toxicity a significant factor? Which effective regimens are the least expensive? The primary literature was used to help answer these questions and develop the criteria; all studies cited are randomized, placebo-controlled and double-blind unless otherwise noted.

Gibbs et al<sup>11</sup> published the first randomized placebo controlled double-blind study investigating antibiotic prophylaxis exclusively in cesarean deliveries in 1972. The authors compared a combination of ampicillin one gram, methicillin one gram and kanamycin 500 mg initiated 15 to 30 minutes pre-operatively repeated 2 and 8 hours



post-operatively to placebo. The febrile morbidity was 29 percent for the treatment group versus 61 percent for the placebo group. These findings were statistically significant ( $p < 0.05$ ). This study established that patients undergoing cesarean deliveries can benefit from prophylactic antibiotics. In 1973, Gibbs and coworkers<sup>12</sup> published a similar study comparing only ampicillin one gram plus kanamycin 500 mg to placebo with similar results (24 percent versus 65 percent infection rate,  $p < 0.05$ ). Moro and Andrews<sup>13</sup> compared cephalothin followed by cephalexin by mouth to complete five days of prophylaxis versus placebo. The febrile morbidity was 8 percent and 29 percent, respectively, but no analysis was presented. Thus the early literature investigated combination regimens for short durations and single drug regimens for long courses of prophylaxis all of which were more effective than placebo. Gall<sup>14</sup> studied the use of cefazolin one gram intramuscularly on call to the operating room followed by cephalothin two grams intravenously 6, 12, and 24 hours post-operatively and found the regimens to be significantly more efficacious than a similarly administered placebo (17.4 percent versus 40.8 percent infections,  $p < 0.05$ ). Rehu and Jahkola<sup>15</sup> compared narrow-spectrum (benzyl penicillin) versus broad-spectrum (clindamycin plus gentamicin) pre-operative antimicrobial prophylaxis. Both regimens proved effective in reducing post-operative endometritis: from 33 percent in the placebo group to 6.5 percent in the penicillin treated group and 9.5 percent in the clindamycin plus gentamicin treated group ( $p < 0.05$ ). McCowan and Jackson<sup>16</sup> found metronidazole 500 mg given intravenously prior to the cesarean section followed by two grams rectally after surgery failed

to reduce the incidence of infection post-operatively. With the data from these studies one can surmise that relative narrow-spectrum prophylaxis is as effective as a broad-spectrum combination prophylaxis, while anaerobic antibiotic prophylaxis alone is no more effective than placebo. A single agent with aerobic and anaerobic activity appears to be effective.

D'Angelo and Sokol<sup>17</sup> conducted the only comparison of the relative effectiveness of short and long courses of therapy versus no prophylaxis within a single patient population. No significant difference was found in the development of endometritis and/or wound infections between patients receiving cefazolin one gram every six hours for four doses and cefazolin one gram every six hours for eight doses followed by cephalexin 500 mg every six hours by mouth to complete five days of prophylaxis. The difference in the incidence of endometritis and/or wound infection between the control group (29.3%)

and both the short- (9.4%) and long- (5.0%) course group were found to be statistically significant ( $p < 0.025$ ). Although the newer, prophylactic antibiotics used in patients undergoing cesarean delivery broader-spectrum antibiotics, third generation cephalosporins and extended spectrum penicillins have been shown to be effective, no direct evidence exists to indicate that they are clinically more efficacious than the less expensive penicillins or first generation cephalosporins, i.e., ampicillin or cefazolin. Toxicity is minimal beginning with the perioperative period and continuing until ordered with these regimens as no antibiotics had to be discontinued secondary to toxicity in the above cited studies.

Based on this literature and the expertise of the OB-GYN faculty, the criteria for appropriate antibiotic prophylaxis of cesarean bacterial endocarditis were established. Patients not receiving prophylaxis were developed. The accepted criteria were one or two grams

of ampicillin, cefoxitin or a first generation cephalosporin injected intravenously every 6 hours for a period not to exceed 24 hours. Patients allergic to both penicillins and cephalosporins should receive any regimen with a similar spectrum of activity that is not contraindicated for the patient.

Cefoxitin is included as an appropriate antibiotic for prophylaxis from a theoretical standpoint based on its spectrum of activity. Cefoxitin has activity against the major pathogens found in patients undergoing cesarean section (namely anaerobes, particularly Bacteroides fragilis, gram-negative enteric organisms and group B streptococci). Hawrylshyn et al<sup>18</sup> demonstrated cefoxitin two grams as a single dose at the time of cord clamping was statistically significantly better than placebo (9.4 percent versus 29.3 percent incidence of endometritis).

METHODS

The initial phase of the study was a Drug Utilization Review of prophylactic antibiotics used in patients undergoing cesarean delivery at the University of Utah Hospital from January 1 to June 30, 1983. The medical charts of 159 patients were reviewed, of these patients, 87 (55 percent) received prophylactic antibiotics. Prophylactic antibiotics were defined as any antibiotics the patient received beginning with the perioperative period and continuing until ordered to be stopped by the physician or until the patient manifested clinical signs of infection as documented by progress notes or temperature recordings. Patients receiving prophylaxis for prevention of subacute bacterial endocarditis were excluded. Patients not receiving prophylaxis were, for the most part, those who underwent elective

repeat cesarean sections or who were already receiving therapeutic antibiotics. Retrospective information obtained from the charts included patient number, time of delivery, history of drug allergies, antibiotic course, the original post-operative order verbatim and febrile course. Because a patient could receive five doses of antibiotics in a 24 hour period, excess cost of prophylaxis was estimated by

RESULTS AND DISCUSSION  
The information obtained from the first DUR was presented to the housestaff on April 12, 1984. Table 2 presents the data from the same drug if it was one of the appropriate antibiotics. When the antibiotic used was not one of the three designated antibiotics the cost of five doses of ampicillin 1 gram was subtracted from the charges incurred by the prophylactic antibiotics the patient actually received to calculate the maximal savings and cefoxitin 2 grams was substituted for ampicillin to calculate the minimal savings. Also listed are similar figures for net hospital acquisition cost for the antibiotics, administration sets and intravenous solutions.

The results of the DUR and supporting data were presented during a meeting of the OB-GYN housestaff and faculty. Particular attention was given to potential cost savings and to limiting prescriptions to a specific number of doses to avoid extended prophylaxis. A brief written summary of the DUR was given to everyone attending the meeting (Appendix I).

The next phase of the study was the completion of a second brief DUR covering the 50 consecutive cesarean deliveries immediately preceding and the same number immediately following the presentation of results to the housestaff. This phase covered a period over which there was minimal change in housestaff on the OB-GYN unit. The medical staff on the unit was unaware of the audit being conducted.

Retrospective data on antibiotic use were collected and changes in the prescribing patterns were analyzed. Chi square analysis was then completed comparing the incidence of inappropriate prophylaxis for the period before the meeting versus the period following the meeting. Statistical significance was considered  $p < 0.05$ .

#### RESULTS AND DISCUSSION

The information obtained from the first DUR was presented to the housestaff on April 12, 1984. Table 2 presents the data from the charts of the 50 consecutive patients having cesarean deliveries prior to the meeting versus the same data on 50 consecutive cesarean section patients following the meeting covering the period from February 7 to June 14, 1984. The incidence of inappropriate prophylaxis was not significantly different. However, results, both prior to (77 percent) and after (89 percent) the meeting differed from those in the initial DUR when only 41 percent of the prophylactic antibiotic courses met the criteria.

Although presenting the data from the DUR to the housestaff did not result in statistically significant increase in appropriate antibiotic prophylaxis used in cesarean sections, a trend of improvement was noted. Possibly the observation period of the follow-up DUR was too brief to show changes following the presentation or the effects on prescribing behavior of the housestaff were short-lived.

Other factors may have influenced prescribing patterns between the time of the initial DUR and the follow-up study. Such factors might include the growing emphasis on reducing medical costs, the influence of the more recent literature demonstrating short courses of

prophylaxis to be as effective as extended prophylaxis, and finally, changes in the housestaff personnel over the year may have affected the results. The housestaff change continuously during the year and a single physician could greatly increase the incidence of extended prophylaxis during a short observation period.

#### CONCLUSION

The incidence of inappropriate prophylaxis has decreased substantially from the previous year but the rate ideally should be zero. Efforts to eliminate inappropriate antibiotic use must be maintained. Continued monitoring is indicated particularly following changes in housestaff as the incidence appears to fluctuate from time to time. Possibly the pharmacists providing services to the obstetrics unit could monitor the prophylactic antibiotic use and intervene when inappropriate orders are written.

Further measures to consider include additional educational programs such as in-services, follow-up discussion at later housestaff meetings or possibly a grand rounds on the topic. Another alternative to consider is an automatic stop order for prophylactic antibiotics similar to the system used by Durbin that reduced the incidence of inappropriate prophylaxis.<sup>7</sup>

Minimum and maximal savings based on the use of the most expensive appropriate drug (cefazolin 2 grams) and the least expensive drug prescribed, respectively, in place of ampicillin, days based on net acquisition cost for the antibiotics, intravenous solutions and administration sets.

Number of cesarean sections performed	171
Number of charts reviewed	156
Number of patients receiving post-operative antibiotics	106
Number of patients with signs of infection (excluded)	19
Number of prophylactic antibiotic courses evaluated	87
Number of prophylactic antibiotic courses not meeting criteria	36 (41%)
Number of prophylactic antibiotic courses meeting criteria	51 (59%)
Estimated excess patient charges incurred	\$ 4,100.00 - 4,100.00
Estimated excess patient charges incurred per year	\$17,182.00 - 11,812.00
Estimated excess hospital acquisition cost per year	\$ 2,213.88 - 2,213.88

Table 1. Initial DRG Results

Table 1. Initial DUR Results

	Pre-Presentation	Post-Presentation
Number of cesarean sections performed		
January-June 1983 . . . . .		171
Number of charts reviewed . . . . .		156
Number of patients receiving post-operative antibiotics . . . . .		106
Number of patients with signs of infection (excluded) . . . . .		19
Number of prophylactic antibiotic courses evaluated . . . . .		87
Number of prophylactic antibiotic courses meeting criteria . . . . .		36 (41%)
Number of prophylactic antibiotic courses not meeting criteria . . . . .		51 (59%)
Estimated excess patient charges incurred <sup>a</sup> . . . . .	\$ 4,703.34	- 4,867.36
Estimated excess patient charges incurred per year <sup>a</sup> . . . . .	\$11,185.51	- 11,575.58
Estimated excess hospital acquisition cost per year <sup>a, b</sup> . . . . .	\$. 2,213.89	- 2,641.66

<sup>a</sup> Minimal and maximal savings based on the use of the most expensive appropriate drug (cefoxitin 2 grams) and the least expensive drug (ampicillin 1 gram), respectively, in place of inappropriate drugs prescribed.

<sup>b</sup> Based on net acquisition cost for the antibiotics, intravenous solutions and administration sets.



Table 2. Follow-up DUR Results

	Pre-Presentation	Post-Presentation
Number of cesarean sections performed	50	50
Number of patients excluded (no prophylaxis, infected or defective heart valve)	19	22
Number of patients receiving prophylaxis	31	28
Number of appropriate prophylactic courses	24 (77%)	25 (89%)
Number of inappropriate prophylactic courses	7 (23%)	3 (11%)

p > 0.3

evidence exists to indicate that they are more effective spectrum penicillins, have been shown to be effective, in direct trials, second and third generation cephalosporins and the extended extended over several days, although the new broad spectrum cephalosporins, less than 24 hours, to be as clinically effective as penicillins. The more recent literature suggests short courses, avoid the regimen contains aerobic and anaerobic activity and is given that has followed shows many regimens to be safe and effective. The work investigating prophylaxis in cesarean section exclusively. The work listed the first randomized placebo controlled double blinded studies antibiotic in patients undergoing cesarean deliveries. Other randomized controlled studies investigating the use of prophylactic antibiotics in patients undergoing cesarean deliveries. Contained in Table I are the results of several prospective

APPENDIX I

University of Utah Hospital. The results of applying these criteria to the cesarean deliveries at the patients undergoing cesarean section. Also, included are the results criteria were developed for the prophylactic use of antibiotics in This article presents a review of the literature from which the the medical staff. The results are based on current literature and the clinical expertise of tion against which the current use of drugs is evaluated. The criteria developing criteria of appropriate drug usage for a specific indication a hospital conduct drug utilization reviews (DIR). A DRG increase The Joint Commission on Accreditation of Hospitals requires that

OF CESAREAN SECTION

ANTIBIOTIC REGIMEN OF ANTIMETABOLIC PROPHYLAXIS

A UTILIZATION REVIEW OF ANTIBIOTIC PROPHYLAXIS  
OF CESAREAN SECTION

Based on the current literature the criteria for this DUR are  
The Joint Commission on Accreditation of Hospitals requires that  
a hospital conduct Drug Utilization Reviews (DUR). A DUR involves  
developing criteria of appropriate drug usage for a specific indica-  
tion against which the current use of drugs is evaluated. The cri-  
teria are based on current literature and the clinical expertise of  
the medical staff.

This article presents a review of the literature from which the  
criteria were developed for the prophylactic use of antibiotics in  
patients undergoing cesarean section. Also, included are the results  
of applying these criteria to 156 cesarean deliveries at the  
University of Utah Hospital.

Contained in Table 1 are the results of several prospective  
randomized controlled studies investigating the use of prophylactic  
antibiotics in patients undergoing cesarean deliveries. Gibbs pub-  
lished the first randomized placebo controlled double blinded studies  
investigating prophylaxis in cesarean section exclusively. The work  
that has followed shows many regimens to be safe and effective pro-  
vided the regimen contains aerobic and anaerobic activity and is given  
perioperatively. The more recent literature supports short courses,  
i.e., less than 24 hours, to be as clinically effective as prophylaxis  
extended over several days. Although the new broad spectrum antibio-  
tics, second and third generation cephalosporins and the extended  
spectrum penicillins, have been shown to be effective, no direct  
evidence exists to indicate that they are more effective

clinically than the less expensive penicillins or first generation cephalosporins, i.e., ampicillin or cefazolin.

Based on the current literature the criteria for this DUR are ampicillin or a first generation cephalosporin or cefoxitin administered intravenously every six hours for no longer than 24 hours. No studies have been published regarding prophylaxis in patients allergic to both penicillins and cephalosporins, therefore an appropriate choice for these patients would be any regimen with a similar spectrum of activity that is not contraindicated for the patient.

The medical charts of 156 patients undergoing cesarean section during the first six months of 1983 were available for review. One hundred six patients received perioperative antibiotics. Nineteen of these patients were either febrile or considered to be infected at delivery or during the first 24 hours post-cesarean section and were excluded from evaluation. Therefore, 87 post-cesarean delivery antibiotics courses were evaluated using the above developed criteria. Fifty-one of the prophylactic courses did not meet the criteria. The estimated excess patient charge incurred is \$4,867.36. This cost is derived from the difference in the cost of the prophylaxis the patient actually received versus the cost that would have occurred using the criteria.

The major reason for the increased cost was not from the use of more expensive antibiotics but from extended periods of prophylaxis beyond 24 hours. It was apparent from reviewing the written orders that when the number of doses or length of therapy was specified in the post-operative order the extended prophylaxis was avoided.

Summary of Literature on Antibiotic Prophylaxis for Cesarean Deliveries

Study	Protocol	Results
1972 Gibbs U. of Pennsylvania	Ampicillin 1g + Methicillin 1g + Kanamycin 0.5g I.M. 15-30 min. pre-op + 2 & 8 hrs post delivery Placebo control, double blind	Febrile Morbidity Treatment Control 27% (9/33) 61% (17/28) p .05
1973 Gibbs U. of Pennsylvania	Ampicillin 1g + Kanamycin 1/2g I.M. 15-30 min. pre-op + 2 & 8 hrs post delivery Placebo control, double blind	24% (8/34) 65% (22/34) p .05
1974 Moro Norfolk, VA	Cephalothin 2g I.V. 15-30 min. pre-op followed by 1g I.V. q6 hrs for 36 hrs followed by Cephalexin 500 mg q6 hrs P.O. until 5th post-op day Placebo control, double blind	8% (6/74) 29% (20/74) no analysis presented
1980 Rehu Helsinki, Finland	Pen G 10 million units I.V. continuous infusion began 30 min. pre-op stopped 4 hrs post-op versus Clindamycin 500 mg I.V. continuous infusion began 30 min pre-op stopped 4 hrs. post-op plus Gentamicin 80 mg I.M. 30 min pre-op double blind	Endometritis Treatment Control 6.5% (3/46) 33.5% (13/40) p .05 N.S. 9.5% (4/42)
1980 McCowan New Zealand	Metronidazole 500 mg I.V. pre-op plus 2g rectal suppository given at the completion of surgery Placebo control, double blind	Febrile Morbidity Treatment Control 37% (13/35) 34% (13/38) Not Significant
1980 D'Angelo Case Western	Cefazolin 1g I.V. q6 hrs for 24 hrs versus Cefazolin 1g q6 hrs for 8 doses followed by Cephalexin 500 mg P.O. q6 hrs to complete 5 days No placebo	Endometritis and/or Wound Infection Treatment Control 29% (7/24) 65% (20/31) p .025 N.S. 20% (5/25)

(continued)



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CURRICULUM VITAE

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EDUCATION

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AWARDS AND HONORS

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AWARDS AND HONORS

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