1979

A retrospective evaluation on the use of Cephalosporins in open-heart surgery

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A RETROSPECTIVE EVALUATION ON THE USE OF CEPHALOSPORINS IN OPEN-HEART SURGERY

A Thesis

Presented to

the Graduate School of the

University of the Pacific

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

by

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August 1979

This thesis, written and submitted by

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is approved for recommendation to the Committee on Graduate Studies, University of the Pacific.

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Dated Aug. 17, 1979

ACKNOWLEDGMENTS

The author wishes to express sincere appreciation to: Dr. Fuad Nahhas for his dedication, guidance, and unending support; Dr. Madhukar Chaubal for his honesty, constructive criticism and interest; Dr. Kishori Chaubal for her time, support and calming effect on the group; Dr. George Herron for his advice, expertise, sense of humor, and for his continuous effort and support in promoting nurse-physician collaboration; Carol Lee Cox, for her constant encouragement and for making this work possible; Steve Guasco and Deann Christiansen for their help in the statistical analysis; and a special thank-you to my parents for their total understanding during the many "four-hour talk restrictions" I levied upon them.

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INTRODUCTION AND HISTORICAL REVIEW

"Has the point been reached where the enormous use of antibiotics is producing as much harm as good? Are the risks beginning to outweigh the benefits?" (Simmone and Stolley, 1974).

On December 7, 1972, a hearing was held in Washington, D. C. on the use and abuse of antimicrobials. Senator Gaylord Nelson of the Sub-committee on Monopoly of the Select Committee on Small Business stated, "Antibiotics are among the most frequently prescribed drugs in this country, exceeded only by the psychoactive drugs." Dr. Charles C. Edwards, former Commissioner of the Food and Drug Administration, recognized that a problem existed and recommended the establishment of a National Task Force on the clinical use of antimicrobials (Kunin, et al., 1973).

The following examples illustrate problems the medical profession faces with antimicrobials.

Of the 33 million patients discharged from general hospitals in 1972, 27% received one or more antibiotics during their hospital stay. This totals almost 9 million patients receiving antibiotics during the course of the year (McGowan, 1976).

Finkel (1978), explained that the amount of injectable cephalosporins certified by the FDA increased from approximately 25 million doses in 1974 to approximately 40 million in 1977.

Antibiotic usage had increased 300% between 1960 and 1970, whereas the population increased only 11% (McGowan, 1976). In 1962 approximately 94 million dollars worth of antibiotics were purchased by hospitals; in 1971 approximately $218 million dollars were spent (Simmone and Stolley, 1974).

Kass (1978), states, "because prophylaxis for all surgical procedures accounted for about 30% of all antibiotic drug use, discontinuing prophylaxis 48 hours after the procedure would save about 20% of all antibiotic drugs used in hospitals. Translated into an annual figure for the country, the prospective saving would be approximately $100 million or more."

Dr. Mark Novitch, Acting Associate Commissioner for the FDA (1979), stated (Antibiotic Audit, 1979), "With antibiotic drug spending running close to a billion dollars a year, the importance of using lower cost drugs that will yield the same results cannot be overstated."

Scheckler and Bennet (1970), in conjunction with the Center for Disease Control (CDC), in Atlanta, Georgia, conducted a study from November 1967 to June 1969. They reviewed the medical records of 5,256 patients to evaluate

antibiotic usage. Results showed that 62% of the patients had no definite evidence of infection.

Another retrospective review, involving cephalosporin usage, in a 1200-bed university hospital revealed that 52% of the cephalosporins prescribed were classified inappropriate by the standards of infectious disease clinicians (Counts, 1977).

Locally, Dr. George Herron, a physician and assistant professor of clinical pharmacy, School of Pharmacy, University of the Pacific (UOP), Stockton, California conducted an antibiotic study at the San Joaquin General Hospital during 1974, (Personal Communication). One hundred and one cases were reviewed, 45.5% were found inappropriate. Inappropriate usage included prescription of an antibiotic other than the drug of choice, or use of an antibiotic in the absence of culture and sensitivity tests. Inappropriate prophylaxis in surgery was also found. There was a trend in the misuse and overuse of the broader spectrum drugs, especially the cephalosporins. Dr. Herron and his pharmacy students speculated that if the trend continues, emergence of resistant bacterial strains and superinfections may occur.

"Danger in misuse of antibiotics becomes apparent," according to Simmone and Stolley (1974), when "Hundreds of thousands of patients may be unnecessarily exposed to the hazards of antibiotics." Hazards include adverse reaction

to antibiotics such as a rash, toxic reaction, morbidity associated with administration, such as chloromycetin associated blood dyscrasias, and anaphylactic shock in about 5% of hopsitalized patients. Misuse also adds to the rising cost of medical care.

Considerable variability in antibiotic usage probably occurs in different hospitals. It is possible that a larger number of resistant organisms are associated with the nosocomial infections in hospitals with greater antibiotic usage although no definite correlation between usage and prevelance of nosocomial infections has been established (Scheckler and Bennett, 1970).

McGowan and Finland (1974) suggested that the major factor responsible for the changing ecology of bacterial flora to Gram negative bacteria and for the marked increase in their occurrence, at least at Boston City Hospital, is the selective pressure of the widely and intensively used antibiotics in therapy and prophylaxis. Finland also believes the overuse of antibiotics may lead to predisposition to infection and selection for superinfections. In 1967, approximately 250,000 Gram negative bacteremias ocurred in American hospitals contributing to at least 50,000 deaths (Simmone and Stolley, 1974).

The preceding problems and studies illustrate the need and justify the regulations for monitoring antibiotics imposed by the Joint Commission on Accreditation of Hospitals (JCAH). The 1976 statement by the JCAH stated, "One of the

basic elements of an effective hospital infection control program involves coordination with the medical staff on action relative to the findings from the regular review of the clinical use of antibiotics. The continuous monitoring of antibiotic usage in the hospital is a medical staff responsibility" (Porterfield, 1976).

Dr. John Porterfield of JCAH recognized the Pharmacy-Therapeutics and Infection Control Committees as the formal organizational elements with the ultimate responsibility for formulating drug usage studies and overall administration of a quality assurance program. It was the opinion of Zeman et al., (1974), that in a large hospital (more than 500 beds) a separate Antibiotic Utilization Committee may more efficiently handle the volume of data and work.

To implement this monitoring system, Brodie and Smith, (1976), recommended five drug utilization review principles: (1) authority, (2) operational and demographic characteristics of the delivery setting and service population, (3) knowledge of the existing pattern of utilization, (4) comparison of the later with local standards, and (5) evaluation of the impact of review on utilization patterns.

Pierpaoli, et al., (1976), suggested that, conceptually, a monitoring program could include utilization of retrospective and prospective chart review processes, complimented by a formal educational program, and in-house controls on the use of certain antibiotics.

A monitoring system could consist of evaluating antibiotics in three possible ways: (1) evaluate the usage of an antibiotic, or a family of antibiotics, in all medical-surgical cases, (2) evaluate one type of medical or surgical problem and review prophylactic and therapeutic use of all antibiotics, or (3) evaluate the usage of one antibiotic in one type of medical or surgical problem.

The third method of studying one antibiotic in one type of clinical condition might have some advantages since the number of variables is much smaller than either of the other two systems. I decided to use this approach and concentrate on open-heart surgery in which the cephalosporins have been used prophylactically.

St. Joseph's Hospital was among the first hospitals in California to initiate a monitoring program. The present investigator was the Infection Control Nurse at the time and played a major role in devising the methods and procedures to be used in such an endeavor at the local and state levels.

Since 1977, data from the surveillance records (Appendix 1) has been tabulated on a monthly basis by the Pharmacy staff at St. Joseph's Hospital. A monthly report (Appendix 2) is presented to the Infection Control and Pharmacy-Therapeutics Committees. Problem areas are discussed and recommendations are forwarded to other medical committees, or further studies are initiated.

From the monthly reports of 1978 three problems were defined: (1) excessive usage of the Cephalosporins, (2) questionable prophylactic use of antibiotics, including duration of therapy, (3) questionable dosing and lack of adequate laboratory monitoring of serum levels of aminoglycosides.

Currently at St. Joseph's Hospital, the Pharmacy staff is concentrating its monitoring efforts on the utilization of aminoglycoside antibiotics in all medical and surgical patients (Appendix 3).

I selected the use of Cephalosporins in open-heart surgery for this retrospective review for the following reasons: (1) only three Cephalosporins (Cephalexin, Keflex^{R}; Cefazolin, Ancef^{R}; Cephalothin, Keflin^{R}) are used prophylactically, (2) only four open-heart surgeons are involved, and (3) standing orders relating to use and administration of Cephalosporins are generally uniform or vary little from one surgeon to another.

R = Registered Trademark (Brand Name)
Keflex^{R} and Keflin^{R} - Eli Lilly and Company, Indiannapolis, IN.
Ancef^{R} - Smith Kline Laboratories, Philadelphia, PA.

MATERIALS AND METHODS

The site of this investigation was St. Joseph's Hospital, a 316-bed, acute-care, non-profit institution in Stockton, California.

Medical records of 33 consecutive patients who had open-heart surgery from September through November 1978 were obtained from the Medical Records Department and were evaluated for pre- and post-operative prophylactic use of antibiotics and any post-operative infections. A check-list monitoring form (Appendix 4), similar to that used for the monthly antibiotic utilization review (Appendix 1), was devised and used to audit records of these open-heart surgery patients.

For each of the 33 patients the dates of admission to the hospital, surgery and discharge from the hospital were recorded. The medication record of each patient relating to the antibiotic dose, route of administration, dose interval and therapy duration (start and stop dates) was also documented. Patient parameters such as daily temperatures (Celcius), total white blood count (WBC), differential with emphasis on segmented and band cells (neutrophils), chest x-rays, and specimen culture data (site, organisms, susceptibility) were also recorded and clinically correlated with

the clinical signs and symptoms to determine any post-operative nosocomial infections.

Antibiotic therapy was then evaluated using five categories: (1) rationale for use, (2) route of administration, (3) dose, (4) duration of pre-operative prophylaxis, and (5) duration of post-operative prophylaxis. According to Prian and Nelson (1978), criteria for prophylactic therapy is defined as: "Depending upon the individual situation, the antibiotic chosen will be prophylactic or therapeutic and may be specific or general in its coverage. When used in the non-infected patient undergoing a clean operation, the use of antibiotics is termed prophylactic". The prophylactic use of antibiotics was judged as appropriate or questionable by criteria established in The Medical Letter on Drugs and Therapeutics (1977).

1. Rationale: The current literature on this topic indicates the prophylactic use of antibiotics in open-heart surgery is justified even though a Class I wound is considered clean and does not justify prophylaxis. A Class I wound is defined as "clean" when the respiratory or gastro-intestinal tract is not surgically entered (Actemeier, 1976).

2. Route of administration: Ancef and Keflin are given intravenously or intramuscularly, and Keflex orally.

3. Dosage: Ancef is usually given 0.500 to 1.000g, every 8 hours; Keflin 1g every 4-6 hours and Keflex 0.250-0.500g every 6 hours, but not to exceed 4g in 24 hours.

4. Duration of pre-operative prophylaxis: "Antimicrobials should generally be given one to two hours before surgery, which is enough time to achieve therapeutic drug levels in the wound during the operation, but not enough time to

select bacteria resistant to the drugs." The time duration criteria for this audit was expanded to twenty-four hours to allow for late admissions or any possible error or deletion in medications.

5. Duration of post-operative prophylaxis: Twenty-four hours of post-operative prophylaxis is considered appropriate therapy. Forty-eight hours was considered appropriate for this review.

Post-operative infections: Complications such as infections of the surgical wound, urinary tract, respiratory tract, septicimia, and infectious endocarditis sometimes result after surgery. The CDC, for example, estimates that approximately 5% of hospitalized patients will develop "nosocomial" infections. The "nosocomial" infections are defined by CDC as "infections which express themselves in hospitalized patients in whom the infection was not present or incubating at the time of admission" and include "infections which are potentially preventable as well as some that may be regarded as inevitable". Since the aim of prophylactic use of antibiotics in open-heart surgery is to prevent, as far as possible, complications of infections, the records of the 33 patients under study were audited for post-surgical infections to determine efficacy of prophylaxis. The records were audited using the following criteria to judge post-operative infectious complications.

1. Surgical wounds: A surgical wound draining purulent material, the culture may or may not be positive.

2. Urinary tract: A colony count on a clean catch or urinary catheter sample exceeding 100,000 bacteria/ml.

3. Post-operative respiratory infections: Purulent sputum, a chest x-ray showing infiltrates or other positive signs, and/or a positive sputum culture.

4. Post-operative septicemia: Presence of bacteria in the blood with clinical signs of infection (Bryan, 1978).

5. Post-operative infectious endocarditis: Bacteremia, fever, splenomegaly, embolic manifestations, new heart murmur, or a positive culture from the valve or heart. Infectious bacterial endocarditis is diagnosed if the patient demonstrates three of the six listed criteria.

The above definitions are for infections only; "Colonization implies the presence of a microorganism in or on a host with growth and multiplication of the microorganism, but without any overt clinical expression or detected immune reaction at the time it is isolated" (Bennett and Brachman, 1979).

The statistical test used in this study was a one-tail independent t-test on the difference of mean time of post-operative prophylactic antibiotic therapy between the infected and non-infected population groups. Additionally, a test was run on the difference of the infection rates for the two groups.

RESULTS

Review of thirty-three medical records for open-heart surgery showed evidence of the following (Table I): Patient data are statistically displayed by the mean with the range included in parenthesis. If a percentage is used the numerator and denominator are included in the parenthesis.

Length of stay: The mean length of stay in the hospital for an open-heart surgery patient was 17 days, (9-39d).

Patient data: The mean baseline clinical data for the 32 patients (one patient expired during the operation) and the ranges (in parenthesis) were: Temperature 37C (35.8-39.6); WBC 10,321 (1500-25,900); Segmented cells 66 (27-97); and Band cells 7 (0-57).

Chest x-ray: Thirty-two patients in the study had a pre- and post-operative chest x-ray. Eighty-four percent (27/32) of the patients were admitted with a normal chest x-ray, 21 of those 27 developed post-operative abnormalities within a mean of 38 hours (0-7d). Sixteen percent of the patients (5/32) were admitted with abnormal chest x-rays, 3 of those 5 developed further chest x-ray abnormalities post-surgery. Differences in infection rates were not significantly different for the two groups.

Infections: According to the criteria described in Materials and Methods, 25% (8/32) of the patients developed nosocomial infections at multiple sites: 22% (7/32) wound, 3% (1/32) urinary, and 9% (3/32) respiratory. None of the patients developed septicemia or infectious endocarditis.

Culture reports: Analysis of the cultures showed the frequency of occurrence for bacteria as follows:

Wound: Twenty-two percent (7/32) of the patients had wound cultures taken. Two of the seven were positive; one had Staph. epidermidis and the other patient a mixed culture of enterococci, Proteus mirabilis and Staph. aureus.

Urine: Forty-four percent (14/32) of the patients had urine cultures taken of which two were positive. E. coli was found in both patients; one patient had a community-acquired infection and the other patient a nosocomial urinary tract infection evident by pre-operative urine cultures.

Sputum: Thirty-four percent (11/32) of the patients had sputum cultures taken of which seven were positive. Thirteen percent (4/32) of the patients were considered to have a colonization whereas 9% (3/32) of the patients were documented as having nosocomial respiratory infections. Organisms recovered from the colonized patients were Beta hemolytic streptococci, non-group A (1/4), Citrobacter diversus (1/4), Enterobacter aerogenes (1/4), Enterobacter cloacae (1/4), and Pseudomonas aeuroginosa (1/4). The

seven positive cultures of the remaining three patients with respiratory infections showed the following organisms: Enterobacter aerogenes (2/7), E. coli (1/7), Klebsiella pneumoniae (1/7), Proteus mirabilis (1/7), P. morganii (2/7), and Pseudomonas fluorescens (1/7). Every patient had more than one organism in his/her sputum.

Blood: Thirteen percent (4/32) of the patients had blood cultures taken and all were reported to have no growth.

Antibiotics: Analysis of days post-operative prophylactic therapy to incidence of patients acquiring nosocomial infections indicated the following: (Table II)

Days of post-operative prophylactic therapy	Number of patients	Percent infection
1	0	--
2	1	0%
3	2	0%
4	1	100%
5	3	33%
6	3	0%
7	5	0%
8	5	20%
9	4	25%
10	2	50%
11	1	0%
12	2	50%
13	0	--
14	2	100%
15	1	0%

The mean duration of antibiotic therapy post-operative was 7.42 days (1-13d). The mean duration for administration of 1 gm Cefazolin IVPB every 8h was 58 hours (1-12d) and oral Keflex 500mg every 6h was 5 days (0-13d). The above data show that only one patient (3%, 1/32), met the criteria for 48 hours maximum duration of post-operative prophylaxis coverage.

Eighty-five percent (28/33) of the patients met the criterion of 24 hours pre-operative prophylaxis. Five patients did not meet the criterion: (1) 2 doses, 2 days prior to surgery; meaning no prophylaxis within 24 hours prior to surgery, with no documented reason, (2) 3 days duration with no documented reason, (3) 8 days of pre-operative prophylaxis due to anticipated pulmonary problems, (4) 16 days pre-operative prophylaxis for anticipated pulmonary problems, and (5) one patient was excluded from the criteria because of expiration during surgery.

The rationale of therapy, route of administration, and drug amount dosage for all patients were 100% appropriate for the criteria selected.

Complications: (Table II) The total post-operative complication rate was 91% (30/33): 25% (8/32) of the patients developed a nosocomial infection, 75% (24/32) chest x-ray complications, and 9% (3/33) miscellaneous complications, such as hepatitis, myocardial infarction, or intra-operative death.

DISCUSSION

The Center for Disease Control (CDC), in Atlanta, Georgia, has developed national standards for the diagnosis of nosocomial infections. Diagnostic tests and signs and symptoms of infections are included in their criteria. Since some of the CDC's criteria are usually masked in open-heart surgery patients, modified criteria were used in this study. Masking of signs and symptoms is demonstrated as follows: the mean temperature of 37C and the mean WBC of 10,321 were within normal limits; yet a 24% (8/33) infection rate existed for these patients. In order to objectively determine infection, the criteria were based on positive microbiological laboratory findings; for example, a urinary tract infection is indicated by a colony count on a clean catch or urinary catheter sample exceeding 100,000 bacteria/ml.

Criteria for evaluating the use of prophylactic antibiotics were a modification of those suggested criteria from The Medical Letter on Drugs and Therapeutics, (1977). The criterion for the pre- and post-operative prophylaxis were modified to meet the needs of open-heart surgery patients, for example, The Medical Letter, (1977), states, "antimicrobial drugs can prevent wound infection and bacteremia

in selected surgical patients, but not without risk. Potential harmful effects include toxic or allergic reaction, bacterial or fungal superinfection, and altering the hospital environment in favor of bacterial strains resistant to antibiotics." The Medical Letter (1977), further states, "antimicrobials should generally first be given one to two hours before surgery, which is enough time to achieve therapeutic drug levels in the wound during the operation, but not enough time to select bacteria resistant to the drugs." However, in this investigation 24 hour pre-operative prophylactic criterion was used in order to allow for any emergency surgeries, late admissions or any possible error or deletion in medications. I believe results from this study and further investigations may yield data which may indicate further limiting of pre-operative prophylactic antibiotic exposure.

For post-operative prophylaxis The Medical Letter (1977), states "prophylactic drugs should be stopped within 24 hours since continuing prophylaxis increases the risk of drug toxicity or bacterial superinfection and does not reduce the incidence of subsequent infection." Controversy exists in the literature as to 24 or 48 hours being the limit for post-operative prophylaxis. The criteria were expanded in this study to 48 hours to allow for the majority of catheters such as intravenous, urinary, central venous pressure and endo-tracheal, to be removed from the patient.

Data obtained using these criteria are summarized in Table I, and show evidence of the following. Twenty-five percent (8/32) of the patients showed incidence of nosocomial infections. The CDC estimates that 5% of all hospitalized patients will develop nosocomial infections (CDC, 1974). The American College of Surgeons estimates a less than 1% wound infection rate for a Class I wound. This investigation shows evidence of a 22% (7/32) wound infection rate which exceeds all documented ranges and is statistically significantly higher than the national standard and therefore presents a serious problem.

The nosocomial respiratory infection rate of 9% (3/32) coupled with a post-operative chest x-ray complication rate of 75% (24/32) is also an area of concern. This problem was not anticipated and needs to be further investigated.

The antibiotic criteria revealed a critical problem in the area of post-operative prophylaxis with only 3% (1/32) of the patients meeting the 48 hour criteria. As indicated in the Introduction, two of the several problems associated with overuse of antibiotics are superinfections and increase in the incidence of Gram-negative infection, both of which are evident in this investigation.

It is evident from the above discussion that a difference exists in number of days post-operative prophylaxis between the infected and non-infected patient groups. A one-tail independent t-test on difference of means was run.

The results are significant at the .06 level but not at the .05 level, Figure I and Figure II. Additionally, a test was run on the difference of the infection rates for the two groups. Patients receiving post-operative prophylactic antibiotics for eight days or less have a 15% nosocomial infection rate. Those patients receiving post-operative prophylactic antibiotics for greater than eight days have a 42% nosocomial infection rate. The results are significant at the .10 level for the two-tail test and significant at the .05 level for the one-tail test.

On the basis of this study the following recommendations are presented:

1. Implement a prospective antibiotic monitoring program for open-heart surgery patients which adheres to the criteria selected for this study. Appropriate statistical analysis could then be documented and hopefully infections, medical costs, and hospital length of stay would be reduced.

2. Investigate the time and duration of pre-operative antibiotic dosing for open-heart surgery patients and determine its effect on post-operative nosocomial infection.

3. Investigate further the high incidence of post-operative chest x-ray complications and nosocomial respiratory tract infections.

4. Standarize post-operative wound care; currently policies and procedures do not exist in this hospital.

5. Require cultures; 9% (3/32) of the patients did not have cultures taken when it was appropriate to do so.

SUMMARY

Medical records of 33 consecutive open-heart surgery patients were evaluated using selected criteria. The total post-operative complication rate was 91% (30/33): 25% (8/32) of the patients developed a nosocomial infection, 75% (24/32) chest x-ray complications and 9% (3/33) miscellaneous complications, such as hepatitis, myocardial infarction, or intra-operative death. The study shows that there is a difference in number of days post-operative prophylaxis between the infected and non-infected patient groups at the .06 level of significance.

Based on this investigation, the following recommendations were presented:

1. Implement a propsective antibiotic monitoring program for open-heart surgery patients which adheres to the criteria selected for this study.

2. Investigate the time and duration of pre-operative antibiotic dosing for open-heart surgery patients and determine its effect on post-operative nosocomial infection.

3. Investigate the high incidence of post-operative chest x-ray complications and nosocomial respiratory tract infections.

4. Standardize post-operative wound care.

5. Require cultures.

Table I

SUMMARY OF MEDICAL RECORDS FOR OPEN-HEART SURGERY

Admission, Surgery, Discharge Length of Stay	Pre-operative Antibiotic	Post-operative Antibiotic IVPB	Post-operative Antibiotic Oral	Temperature Average Range	WBC Average Range	Segmented Cells Average Range	Band Cells Average Range	Chest X-Rays	Cultures	Post-Operative Complications
8-25-78 8-29-78 9-6-78 12	24 h	48 h	3 d	36.8 36.2-37.4	14,742 7800-23,500	67 53-90	5 1-12	8-25 & 8-29, clear; 8-31, R. base discoid atelectasis; 9-1, pleural effusion L.L. base	9-21, L. thigh Staph. aureus, Proteus mirabilis, Enterococci	Readmitted 9-18, debridement L. thigh acute cellulitis, gaping wound with drainage. 9/3 chest incision open & draining. 48h post-op atelectasis R. base.
9-4-78 9-6-78 9-15-78 11	24 h	48 h	5 d	37 36-38.8	8855 5500-13,100	70 57-85	3 1-6	9-6, infil. L. lung; 9-7, infil. R. base; 9-8, 9, 11, 15, atel. R. & middle lobes & R. base	9-12 sputum, normal flora	8hr post-op atelectasis
9-4-78 9-12-78 9-26-78 22	24 h	48 h	10 d	37 36-38.6	15,750 4100-23,100	68 51-91	16 1-41	9-12,14,15, clear 9-16, CHF & infiltrates 9-17, atelectic R. base	9-21 urine 10^3 Pseudomonas	4 d post-op infiltrative changes and congestive heart failure
9-5-78 9-7-78 9-16-78 11	24 h	48 h	6 d	37 37-37	9227 5700-14,600	65 36-81	4 0-10	9/7-14, pleural fluid effusions	------	abnormal chest x-ray from time of admission and post-op. No further complications.
9-5-78 9-7-78 9-16-78 11	24 h	48 h	5 d	37 37-37.8	13,850 9300-20,100	56 44-82	10 1-35	normal chest x-ray during hospitalization	------	------

Table 1. Continued.

Admission, Surgery, Discharge Length of Stay	Pre-operative Antibiotic	Post-operative Antibiotic IVPB	Post-operative Antibiotic Oral	Temperature Average Range	WBC Average Range	Segmented Cells Average Range	Band Cells Average Range	Chest X-Rays	Cultures	Post-Operative Complications
9-5-78 9-12-78 9-21-78 16	24 h	48 h	4 d	36.8 36.2- 38.2	8527 6700- 11,800	64 51-91	5 0-13	9/6-13, clear 9/14-17, bilateral pleural effusion 9/19, atelectasis L. base 9/21, resolving	-----	48 h post-op pleural effusion with further atelectasis L. base.
9-9-78 9-11-78 9-22-78 13	24 h	48 h	1 d	37.2 36.2- 38.6	9608 8400- 13,300	58 52-88	5 1-15	9/9-11, normal cxr 9/12, infil. or atel L.L.L. 9/13, bil. pleural eff. 9/16, atel. L. base 9/18, bil. pleural eff. 9/19 & 22, infil. & atel. L.L.L.	9/13 blood, no growth 9/14 sputum, normal flora	24 h post-op infiltrate or infil. L.L.L. 48 h post-op bilateral pleural effusions
9-10-78 9-13-78 9-22-78 12	24 h	24 h	5 d	37 37- 37.2	7511 6100- 11,200	69 47-92	5 0-24	9/10, 12, 13, 14, clear 9/15, 16, 17, 19, 21, 22, atelectic changes in bases	9/18 sputum, normal flora w/Staph. aureus	48 h post-op atelectasis in bases
9-16-78 9-19-78 10-4-78 19	24 h	48 h Ancef, 72 h Naf-cillin	9 d	37 36- 38.4	11,950 5700- 20,400	75 64-86	6 0-17	9/15,19,20,21,22, clear 9/24,25,26, pleural eff. 9/27, atel. or infil. L.L. base; 9/28, clearing; 9/29, fluid in pleural space, infil. or atel. R.L.L.	9/22 R. mediastial tube; Staph. epidermidis 10/16 chest incision; Staph. epidermidis 10/21 sternal wound; Staph. epidermidis	readmitted 10/16 sternotomy wound infection; 5 d post-op pleural effusion
9-20-78 9-22-78 10-10-78 21	24 h	48 h	5 d	37.2 36.6- 37.6	9611 6100- 17,900	74 60-93	2 0-4	9/20,22,23,24 clear 9/26,28, bilateral basal pleural effusions 10/1, clearing	9/25 urine, no growth 9/25 sputum, Enterobacter cloacae	4 d post-op pleural effusion sputum culture is colonization

Table 1. Continued.

Admission, Surgery, Discharge Length of Stay	Pre-operative Antibiotic	Post-operative Antibiotic IVPB	Post-operative Antibiotic Oral	Temperature Average Range	WBC Average Range	Segmented Cells Average Range	Band Cells Average Range	Chest X-Rays	Cultures	Post-Operative Complications
9-25-78 9-29-78 10-9-78 15	24 h	48 h Ancef; 48 h Naf.	4 d Keflex; 1 d Clox.	37 36.4-37.8	14,933 7800-25,900	62 47-83	6 0-18	9/25,26,27,28, clear 9/29, L. base atelectasis 9/20,10/1,2,3,4, atel. or infil. L. base 10/6 L. basal effusion	9/27 urine, no growth (culture not taken of chest incision)	1 nosocomial wound infection of chest incision atelectasis on day of operation 7 d post-op basal effusion
9-26-78 9-28-78 10-17-78 22	24 h	96 h	10 d	37 36-37.4	9243 5400-14,500	69 57-77	7 1-17	9/26 normal cxr 9/24,30,10/1,2, infil. L.base; 10/3 density R. mid lung; 10/6 bil. basal effusion & L.L.L. atelectasis	10/1 urine no growth 10/2 sputum Pseudomonas fluorescens Enterobacter aerogenes	1 nosocomial respiratory infection 24 h post-op infiltrate L. base.
9-30-78 10-2-78 10-30-78 31	24 h	240h Ancef; 48 h Naf.	---	37 36-39.4	10,605 5700-19,500	68 52-83	12 4-32	10/29, 10/2-4, clear 10/5 L. base atel. or infil.; 10/6 atel. L. U.L.: 10/7,9, bil. atel.; 10/10 resolving; 10/16 basal atel. or effus. 10/18-21, R. pleural eff. 10/23 R. pleural fluid; 10/24, atel. R. base; 10/26,29 atel. clearing	10/10 sputum Proteus morganii, Proteus mirabilis 10/11 urine 10^4 mixed flora with Pseudomonas 10/10 CT site no growth 10/18 sputum normal flora 10/18 sputum Proteus morganii, Proteus mirabilis, Klebsiella pneumoniae; 10/19 pleural fluid no growth	1 nosocomial chest tube site wound infection; 1 nosocomial respiratory infection. (Chest tube site draining copious yellow-drainage, foul smelling) 3 d post-op atelectasis
10-2-78 10-5-78 10-15-78 13	48 h	48 h	6 d	37 36-37.8	8083 4600-11,900	63 50-75	15 8-26	10/2 normal cxr 10/5,6, atelectic changes L. base; 10/7, 9, 11, 14, atelectasis L. base	-----	atelectic changes L. bases on day of surgery

Table 1. Continued.

Admission, Surgery, Discharge Length of Stay	Pre-operative Antibiotic	Post-operative Antibiotic IVPB	Post-operative Antibiotic Oral	Temperature Average Range	WBC Average Range	Segmented Cells Average Range	Band Cells Average Range	Chest X-Rays	Cultures	Post-Operative Complications
10-3-78 10-18-78 10-30-78 27	192h	72 h	5 d	37 36- 37.6	10,850 8600- 13,300	61 50-80	6 0-17	10/3,10,18-21, normal 10/22,24,26,28, atel. L.L.L.	10/19 graft no growth	1 nosocomial wound infection-lower leg per discharge summary. 4 d post-op atelectasis L.L.L.
10-4-78 10-11-78 10-20-78 16	24 h	48 h	5 d	37 36.8- 37.6	7681 6400- 9100	59 48-76	6 0-30	10/4 chronic obstructive lung disease?; 10/10 normal cxr; 10/11-13 atel. L. base; 10/14, 16, 18, bilateral atelectasis	10/10 urine no growth	atelectasis L. base on day of surgery
10-5-78 10-16-78 10-23-78 18	24 h	48 h	4 d	37 36- 38.8	9990 7100- 15,400	61 33-85	9 0-27	10/6,10,16,17, normal 18/18 effusion L. base 10/21 infil. or pleural reaction L. base	-----	48 h post-op L. base effusion
10-6-78 10-9-78 10-21-78 15	24 h	48 h	9 d	37 36- 38.4	7630 5800- 11,500	66 50-85	5 1-10	10/6,9, normal cxr 10/10, discoid atel. R. base 10/11, basal hazy densities 10/12, 14, bil. pleural fluid; 10/16, 18,19,20, atel. & eff. both bases	-----	24 h post-op discoid atelectasis R. base; 72 h post-op pleural fluid bilaterally
10-6-78 10-20-78 11-12-78 37	16 h	48 h	2 d	37 37- 37.6	10,326 5209- 16,600	71 58-83	8 1-22	10/18,20,21, normal; 10/22,23,25,27,29, fluid in L. base; 10/31, 11/3, 6,9, normal cxr	10/6 urine no growth 10/17 urine E. coli 10/23 urine no growth	1 nosocomial leg wound infection readmitted 11/27 1 nosocomial urinary tract infection

Table 1. Continued.

Admission, Surgery, Discharge Length of Stay	Pre-operative Antibiotic	Post-operative Antibiotic IVPB	Post-operative Antibiotic Oral	Temperature Average Range	WBC Average Range	Segmented Cells Average Range	Band Cells Average Range	Chest X-Rays	Cultures	Post-Operative Complications
10-10-78 10-12-78 10-21-78 11	24 h	48 h	7 d	37 36.8- 37.8	8460 3900- 16,400	63 48-85	6 1-27	10/8 no active pulm. disease; 10/12,13, L. pleural eff.; 10/14, 16, 18, L.L.L. atel.; 10/20, L. pleural eff. & basilar atel. changes	-----	pleural effusion on day of surgery 48 h post-op atelectasis L.L.L.
10-11-78 10-13-78 10-20-78 9	24 h	48 h	5 d	37 36.6- 37.2	12,028 9300- 15,400	60 54-70	6 1-19	10/9, 13,14,15,17,19, normal chest	10/12 clean catch urine, no growth in 18 h, 10^3 Lactobacilli in 48 h	-----
10-16-78 11-1-78 11-24-78 39	384h	96 h	6 d	37 36- 38.4	10,654 4000- 19,700	69 59-97	7 1-32	10/16 CHF; 10/20,31, COLD 11/1 pulm. edema 11/2,3, RUL infil.; 11/5,6, R. pleural eff; 11/9 resolving; 11/10, 11,13,14,15,17, 19,20, L.L.L. infiltrate.	10/16 spu, normal flora 10/20 spu, B strep, not A 10/23,30, spu, normal flora; 11/3, spu, P. morganii, Enterobacter aerogenes, E. coli; 11/10, spu, E. coli, P. morganii, 11/11, spu, Enterobacter aerogenes, E. coli; 11/15, Staph. epidermidis, yeasts, P. morganii; 10/20, urine no growth, 11/9 chest wound, no growth; 11/11 blood, no growth.	1 nosocomial respiratory infection, 24 h post-op infiltrate RUL, 4 d post-op pleural effusion.

Table 1. Continued.

Admission, Surgery, Discharge Length of Stay	Pre-operative Antibiotic	Post-Operative Antibiotic IVPB	Post-operative Antibiotic Oral	Temperature Average Range	WBC Average Range	Segmented Cells Average Range	Band Cells Average Range	Chest X-Rays	Cultures	Post-Operative Complications
10-20-78 10-23-78 11-12-78 23	72 h	96 h	1 d	36.8 36.4- 37.8	13,484 7800- 18,000	59 42-75	12 2-31	10/20,23,24,25, clear; 10/26 R. pleural fluid 10/27,28, base density 10/31,11/2, L. eff.; 11/10 L. base infil. or atelectasis.	10/23 urine, no growth 10/27 mitral valve, no growth, 10/27 urine, $16x10^3$ Candida albicans; 10/27 spu, Pseudomonas aeruginosa; 10/29 urine, no growth; 10/30 spu, Pseudomonas aeruginosa; 10/30 urine, 500/cc Candida albicans	3d post-op R. pleural fluid, sputum is considered to be colonized.
10-21-78 10-24-78 11-2-78 12	24 h	48h	7 d	36.8 35.8- 38.8	12,877 5700- 15,900	66 56-85	10 3-30	10/21,24, normal; 10/26, L. base pleural fluid; 10/27, pleural eff.; 10/29, atel. or infil.; 10/31,11/2, clearing.	11/2, chest incision normal flora	48 h post-op pleural fluid in L. base, 5 d post-op atelectasis and/or infiltrate L. side.
10-23-78 10-26-78 11-6-78 14	24 h	72 h	---	37.9 36- 39.6	7900 5000- 12,900	59 27-73	7 2-10	10/23,26,27,28, normal 10/30, R.L.L. atel. or infil.	10/24 urine, E. coli (community-acquired); 10/30 blood, no growth 10/30 urine, no growth	4 d post-op R.L.L. infiltrate or atelectasis, "viral" infection fever related to chest x-ray per Doctor.
10-29-78 10-2-78 11-11-78 13	24 h	48 h	7 d	37.2 36- 39	7000 1500- 11,200	58 31-79	19 1-57	10/29,11/2,3,4, normal 11/5, L. base small pleural reaction; 11/7, atel. L. base.	11/4 chest tube, no growth	3 d post-op pleural reaction 5 d post-op atelectasis L. base

Table 1. Continued.

Admission, Surgery, Discharge Length of Stay	Pre-operative Antibiotic	Post-operative Antibiotic IVPB	Post-operative Antibiotic Oral	Temperature Average Range	WBC Average Range	Segmented Cells Average Range	Band Cells Average Range	Chest X-Rays	Cultures	Post-Operative Complications
11-2-78 11-7-78 11-22-78 20	24 h	48 h	13 d	36.6 35.8- 37.2	9790 8000- 12,600	67 53-81	3 0-12	11/2,7,8,9,11,13,14, 15,17,19, normal.	11/5 urine, no growth	post-op myocardial infarction
11-4-78 11-6-78 11-16-78 12	24 h	48 h	8 d	36.6 36- 38.2	11,650 6300 14,700	73 61-78	5 0-11	11/3,6 L. base atel.; 11/7,8,9,10, clearing; 11/13,14, clear.	11/12 spu, B strep, not A and Enterobacter aerogenes.	readmitted 12/29 chronic hepatitis, "etiology unknown" sputum is considered to be colonized.
11-4-78 11-8-78 11-17-78 13	24 h	48 h	3 d	37.6 36.8- 39.6	9300 5300- 14,600	70 51-82	8 1-19	11/5 normal; 11/8 infil. R. lung; 11/10,11,12, 15, R. and L. mid-lung infiltrate.	11/12 pacer wire site no growth; 11/9 mitral valve, no growth; 11/12 urine no growth; 11/14 blood no growth.	"antibiotic fever? does not look sick", infiltrate on day of surgery.
11-6-78 11-7-78 11-15-78 11	24 h	72 h	5 d	37 36.6- 37.4	12,042 7900- 17,400	58 45-76	3 0-7	11/6,7,8, normal; 11/10 12,14, atel. or infil. L. base plus sm. R. pleural effusion.	11/10 urine, no growth	3 d post-op atelectasis or infiltrate L. base plus small R. pleural effusion.
11-7-78 11-9-78 11-18-78 11	24 h	72 h	5 d	37.6 36.6- 39.2	7340 5000- 9600	70 58-75	13 2-19	11/7,9, clear; 11/10 atel. L. base; 11/11 atel. L. & R. lungs; 11/13 clear.	11/13 blood, no growth; 11/13 urine, no growth; 11/14 sputum, Citrobacter diversus.	24 h post-operative atelectasis, sputum is considered to be colonized.
11-12-78 11-27-78 11-27-78 15	24 h	----------DECEASED----------						11/12 no active pulmonary disease.	-----	Deceased on operative table; intraoperative cardiac insufficiency due to severe coronary arteriosclerosis and pulmonary emphysema (autopsy report).

Table 1. Continued.

Admission, Surgery Discharge Length of Stay	Pre-operative Antibiotic	Post-operative Antibiotic IVPB	Post-operative Antibiotic Oral	Temperature Average Range	WBC Average Range	Segmented Cells Average Range	Band Cells Average Range	Chest X-Rays	Cultures	Post-Operative Complications
11-17-78 11-20-78 11-28-78 11	24 h	24 h	1 d	37 36.2- 38	8800 7300- 11,000	70 46-83	4 0-8	11/17,20, normal; 11/21 small infil. L.L.L.; 11/24 atelectic strand R. mid-thorax.	11/25 sputum, normal flora.	24 h post-op infiltrate L.L.L.

Table II

Analysis of Post-Operative Complications and Post-Operative Antibiotics

Patient	IVPB Duration	Oral Duration	Total	Complications
1	48 h	3 d	5	2 nosocomial wound infections 48 hr. post-op atelectasis
2	48 h	5 d	7	48 hr. post-op atelectasis
3	48 h	10 d	12	4 days post-op infiltrative changes and CHF
4	48 h	6 d	8	-----
5	48 h	5 d	7	-----
6	48 h	4 d	6	48 hr. post-op pleural effusion and atelectasis
7	48 h	1 d	3	24 hr. post-op infiltrate or atelectasis; 48 hr. pleural effusions
8	24 h	5 d	6	48 hr. post-op atelectasis
9	120 h	9 d	14	1 nosocomial wound infection 5 days post-op pleural effusion
10	48 h	5 d	7	4 days post-op pleural effusion
11	96 h	5 d	9	1 nosocomial wound infection atelectasis on day of surgery 7 days post-op basal effusion
12	96 h	10 d	14	1 nosocomial respiratory infection; 24 hr. post-op infiltrate
13	288 h	--	12	1 nosocomial wound infection 1 nosocomial respiratory infection 3 days post-op atelectasis
14	48 h	6 d	8	atelectic changes on day of surgery
15	72 h	5 d	8	1 nosocomial wound infection 4 days post-op atelectasis

Table II. Continued.

Patient	IVPB Duration	Oral Duration	Total	Complications
16	48 h	5 d	7	atelectasis day of surgery
17	48 h	4 d	6	48 hr. post-op basal effusion
18	48 h	9 d	11	24 hr. post-op atelectasis 72 hr. post-op pleural fluid
19	48 h	2 d	4	1 nosocomial wound infection 1 nosocomial urinary infection
20	48 h	7 d	9	pleural effusion on day of surgery 48 hr. post-op atelectasis
21	48 h	5 d	7	-----
22	96 h	6 d	10	1 nosocomial respiratory infection 24 hr. post-op infiltrate 4 days post-op pleural effusion
23	96 h	1 d	5	3 days post-op pleural fluid
24	48 h	7 d	9	48 hr. post-op pleural fluid 5 days post-op atelectasis and/or infiltrate
25	72 h	---	3	4 days post-op infiltrate or atelectasis
26	48 h	7 d	9	3 days post-op pleural reaction 5 days post-op atelectasis
27	48 h	13 d	15	post-op myocardial infarction
28	48 h	8 d	10	readmitted 12/29 chronic hepatitis; etiology unknown
29	48 h	3 d	5	infiltrate on day of surgery
30	72 h	5 d	8	3 days post-op atelectasis or infiltrate
31	72 h	5 d	8	24 hr. post-op atelectasis
32	---	---	--	deceased on table, intra-operative cardiac insufficiency.
33	24 h	1 d	2	24 hr. post-op infiltrate

Figure I. Frequency Distribution - Days of Post-Operative Prophylactic Antibiotic Therapy

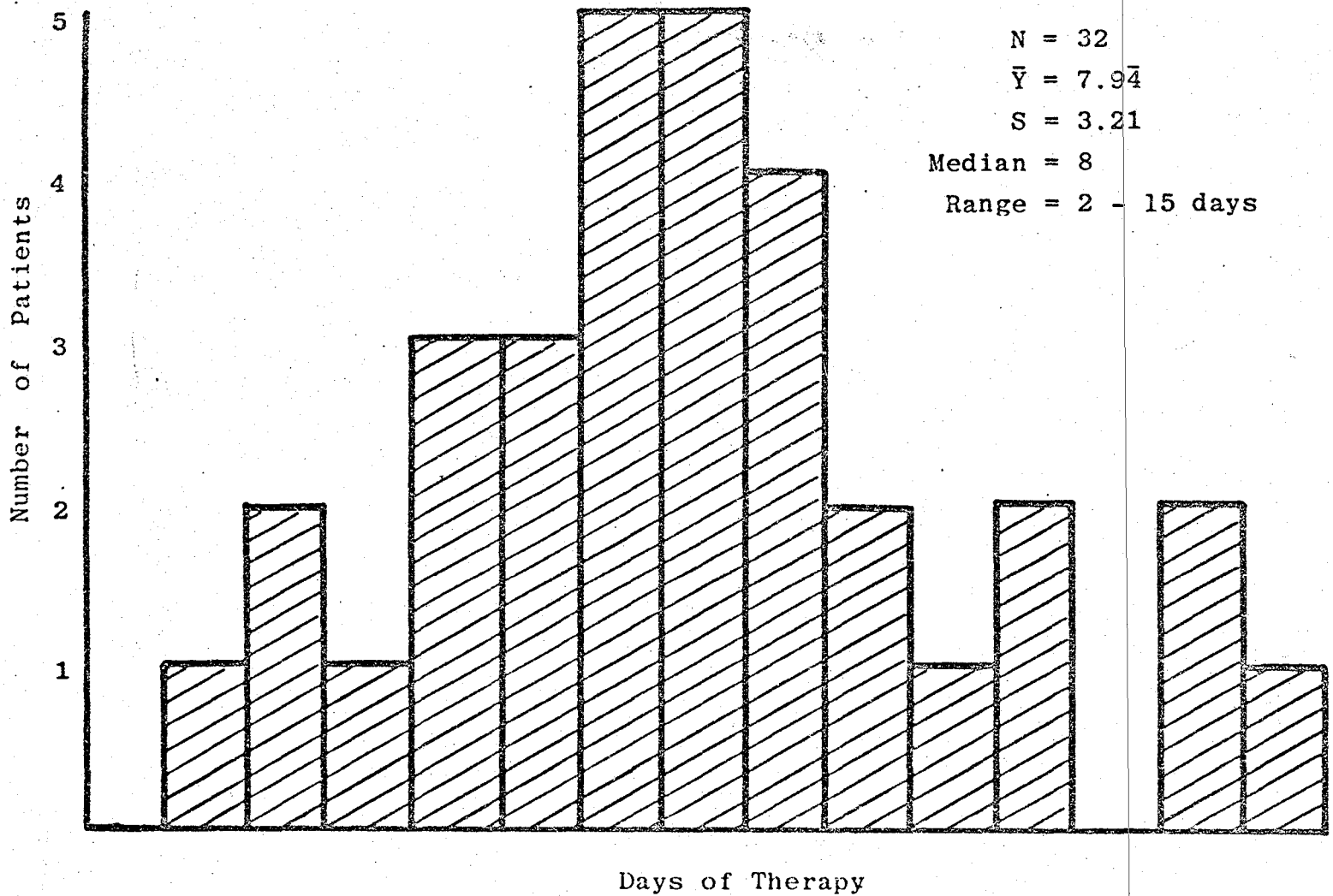
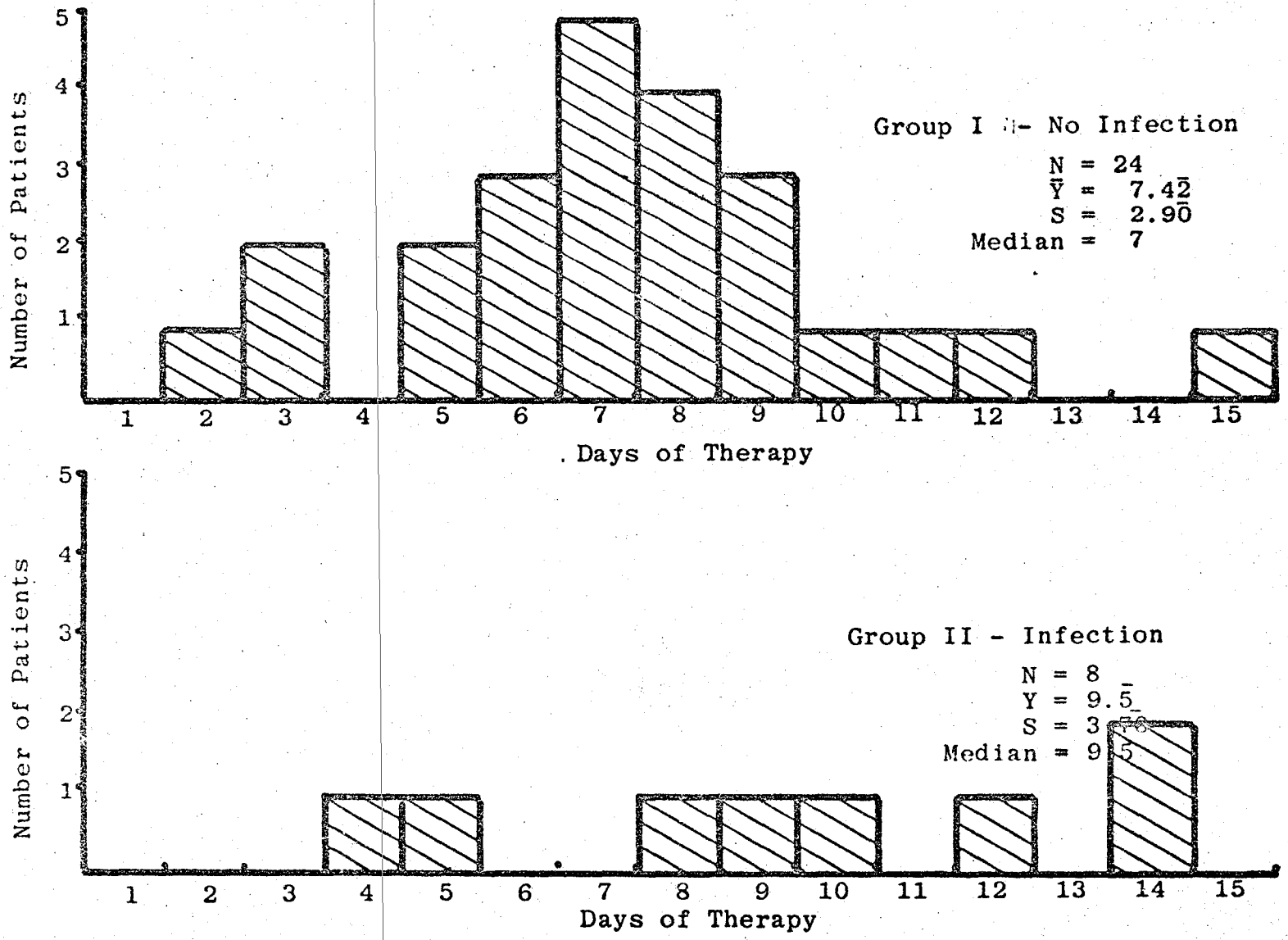


Figure II. Frequency Distributions — Days of Post-Operative Prophylactic Antibiotic Therapy for the Infected and Non-Infected Groups of Open-Heart Surgery Patients



APPENDIX 1

HOSPITAL ANTIMICROBIAL SURVEILLANCE

RECORD SHEET

Rm: ______ ANTIMICROBIAL SURVEILLANCE RECORD SHEET

NAME: ________________ Wt. ______

Admitting Diagnosis: ______________________

Drug Allergies: ______________________

Significant History: ______________________

ANTIBIOTIC	DOSE	ROUTE	INTERVAL	START	STOP	MD

PROPHYLACTIC:

Why ____________ Wound Class _____ If Surgery, date ______

Rationale stated?_____ If yes, what ______________

Agent, dose, and route appropriate?____ If combination, appropriate? _______

THERAPEUTIC: YES NO

Diagnosis of infectious disease documented prior to Rx? _____ _____

Based on ______________________

Appropriate cultures obtained prior to Rx? _____ _____

Monitored

Day 1 ______
2 ______
3 ______
4 ______
5 ______
6 ______
7 ______
8 ______
9 ______
10 ______
11 ______
12 ______
13 ______
14 ______
15 ______
16 ______
17 ______
18 ______
19 ______
20 ______

PATIENT DATA:

Date										
Temperature										
Total WBC's										
Segs										
Bands										
BUN										
Creatinine										

AMINOGLYCOSIDE MONITORING:

Date										
Time drawn										
Time of dose										
Blood level mcg/ml										

CULTURES:

SENSITIVE=O RESISTANT=X INTERMEDIATE=I

DATE	SITE	ORGANISMS	SENSITIVITIES
			PG RP ER CL TE CH KA CE AM GE CA PO TO NI NA SU ST
			PG RP ER CL TE CH KA CE AM GE CA PO TO NI NA SU ST
			PG RP ER CL TE CH KA CE AM GE CA PO TO NI NA SU ST
			PG RP ER CL TE CH KA CE AM GE CA PO TO NI NA SU ST
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			PG RP ER CL TE CH KA CE AM GE CA PO TO NI NA SU ST
			PG RP ER CL TE CH KA CE AM GE CA PO TO NI NA SU ST

CHEST X-RAYS: (date and report)

7170-024-1

COMMENTS: (date, summary, and initial)

PHYSICIAN CONTACT: (date, reason, and outcome)

APPENDIX 2

HOSPITAL PHARMACY ANTIMICROBIAL MONITORING REPORT

ST. JOSEPH'S HOSPITAL PHARMACY ANTIMICROBIAL MONITORING REPORT

DURATION: Sept 1 - Sept. 30 1978

TOTAL NUMBER OF PATIENTS MONITORED 242 *

I. PROPHYLACTIC THERAPY

	NO.	%
A. Total number of patients treated prophylactically:	100	100 %
1. Surgical patients	90	90 %
2. Non surgical patients	10	10 %

B. If Prophylactic:

	Appropriate NO.	Appropriate %	Questionable NO.	Questionable %
1. Was the rationale	92	92 %	8	8 %
2. Was the dosage	98	98 %	2	2 %
3. Was the route	100	100 %	-	- %
4. Was the agent selected	99	99 %	1	1 %
5. If combination of Rx, was this	9	%	-	- %

C. Number of times physician notified:

1. Reasons:	NO.	NO. OF CHANGES
a) Agent selected	1	0
b) Dosage	2	0
c)		
d)		

2. Percent of patients being treated prophylactically where a change in therapy resulted. 0 %

D. Average Duration of Prophylactic therapy. 2.65 days

Range 1 dose - 10 days

4/79

II. THERAPEUTIC THERAPY

	NO.	%
A. Total number of patients treated therapeutically:	142	100 %

B. If Therapeutic:

	YES NO.	YES %	NO NO.	NO %
1. Diagnosis of infectious disease	141	99.3%	1	.7 %
2. Diagnosis documented prior to Rx	141	99.3%	1	.7 %
3. Cultures obtained prior to Rx	122	90 %	20	10 %
4. Cultures appropriate	122	100 %	-	- %
5. Blood cultures obtained	68	48 %	74	52 %
6. Rationale stated	141	99.3%	1	.7%

	Appropriate NO.	Appropriate %	Questionable NO.	Questionable %
7. Was the rationale	141	99.3%	1	.7%
8. Was the agent selected	138	97 %	4	3%
9. Was the dosage	140	99 %	2	1%
10. Was the route	142	100 %	-	-%
11. If combinations, was it	27	100 %	-	-%

C. Number of times physician contacted:

1. Reasons:	NO.	NO. OF CHANGES
a) Dosage	2	1
b) Agent	4	1
c) Resistance	5	5
d) Rational	1	0

2. Percent of patients being treated therapeutically where a change in therapy resulted. 4.0%

ST. JOSEPH'S HOSPITAL PHARMACY ANTIMICROBIAL MONITORING REPORT

DURATION: Sept. 1 - Sept. 30 1978

TOTAL NUMBER OF PATIENTS MONITORED 243 *

III. DRUG USAGE

	NO.	%
A. Cephalosporins	151	62
B. Penicillin Group	79	33
C. Amino Glycoside Group	49	20
D. Chloramphenicol	5	2
E. Misc.	24	10

IV. SURGICAL WOUND CLASSIFICATION BY SERVICE - FOR PATIENTS TREATED WITH ANTIMICROBIALS

	I	II	III	IV
A. Ear/Eye/Nose/Throat	-	-	-	-
B. General Surgery (GI)	3	12	8	1
C. OB/GYN	-	16	-	1
D. Orthopedics	5	5	4	2
E. Neurology	3	1	1	-
F. Urology	3	2	1	-
G. Vascular/Thoracic	28	9	-	1
OHS	10			

*This represents all patients on parenteral antimicrobials with the addition of orals for those patients on Fourth East.

4/78

APPENDIX 3

HOSPITAL AMINOGLYCOSIDE MONITORING REPORT

DURATION _____

TOTAL NUMBER OF PATIENTS MONITORED _____

ST. JOSEPH'S HOSPITAL PHARMACY
ANTIMICROBIAL MONITORING
REPORT

I. THERAPEUTIC THERAPY OF AMINOGLYCOSIDES

	NO.	%	SCREENING	THRESHOLD FOR ACTION	ACUTAL
A. Total number of patients treated therapeutically:	___	___	___	___	___

	YES		NO				
	NO.	%	NO.	%			
1. Diagnosis of infectious disease	___	___	___	___	___	___	___
2. Diagnosis documented prior to Rx	___	___	___	___	___	___	___
3. Cultures obtained prior to Rx	___	___	___	___	___	___	___
4. Cultures appropriate	___	___	___	___	___	___	___
5. Blood cultures obtained	___	___	___	___	___	___	___
6. Rationale state	___	___	___	___	___	___	___
7. Aminoglycoside levels	___	___	___	___	___	___	___
8. Creatinine, Bun	___	___	___	___	___	___	___
	Appropriate		Questionable				
9. Was the rationale	___	___	___	___	___	___	___
10. Was the agent selected	___	___	___	___	___	___	___
11. Was the dosage	___	___	___	___	___	___	___
12. Was the route	___	___	___	___	___	___	___
13. If combinations, was it	___	___	___	___	___	___	___

B. Number of times physician contacted:

1. Reasons:	NO.	NO. OF CHANGES
_____	___	___
_____	___	___
_____	___	___
_____	___	___

2. Percent of patients being treated therapeutically where a change in therapy resulted. ___%

SEE OTHER SIDE

I. PROSPECTIVE AUDIT CYCLE

1. Problems Identified:

2. Recommendations:

3. Action Taken:

4. Comments:

APPENDIX 4

RETROSPECTIVE EVLAUATON ON THE USE OF CEPHALOSPORINS IN OPEN-HEART SURGERY

RETROSPECTIVE EVALUATION ON THE USE OF CEPHALOSPORINS IN OPEN-HEART SURGERY

PATIENT NUMBER: _____

ADMISSION DATE: _____

SURGERY DATE: _____

DISCHARGE DATE: _____

ANTIBIOTIC	DOSE	ROUTE	INTERVAL	START	STOP

I. Antimicrobial Therapy for Open-Heart Surgery

A. If prophylactic: appropriate/questionable

1. Was the rationale _____/_____

Criteria: Prophylactic use of antibiotics in open heart surgery is justified.

2. Was the route _____/_____

Criteria: Ancef and Keflin are given intravenously or intramuscularly, and Keflex orally.

3. Was the dosage _____/_____

Criteria: Ancef is usually given 0.500 to 1.000g, every 8 hours; Keflin 1g every 4-6 hours and Keflex 0.250-0.500g every 6 hours, but not to exceed 4g in 24 hours.

4. Was the duration of pre-op prophylaxis _____/_____

Criteria: 24 hours maximum; 1-2 hours minimum.

5. Was the duration of post-op prophylaxis _____/_____

Criteria: 48 hours maximum; 24 hours minimum.

B. Complications: Yes / No

1. Did the patient acquire a nosocomial infection _____/_____

Criteria: "Infections which express themselves in hospitalized patients in whom the infection was not present or incubating at the time of admission" and include " infections which are potentially preventable as well as some that may be regarded as inevitable". ref: Center for Disease Control (1974)

	Yes	No
2. Did the patient acquire a nosocomial wound infection		/

Criteria: A surgical wound draining purulent material, the culture may or maynot be positive.

	Yes	No
3. Did the patient acquire a nosocomial urinary tract infection		/

Criteria: A colony count on a clean catch or urinary catheter sample exceeding 100,000 colonies/ml.

	Yes	No
4. Did the patient acquire a nosocomial respiratory tract infection		/

Criteria: Purulent sputum, a chest x-ray showing infiltrates or other positive signs, and/or a positive sputum culture.

	Yes	No
5. Did the patient acquire a nosocomial septicemia		/

Criteria: Presence of bacteria in the blood with clinical signs of infection.

	Yes	No
6. Did the patient acquire a nosocomial infectious endocarditis		/

Criteria: Bacteremia, fever, spenomegaly, embolic manisfestations, new heart murmer, or a positive culture from the valve or heart. Infectious bacterial endocarditis is diagnosed if the patient demonstrates three of the six listed criteria.

COMMENTS:

C. Patient Data

DATE													
TEMPERATURE													
TOTAL WBC													
SEGS													
BANDS													
DATE													
TEMPERATURE													
TOTAL WBC													
SEGS													
BANDS													

CHEST X-RAYS (date and report

CULTURES

DATE	SITE	ORGANISM	SUSEPTIBILITIES S=O R=X
			PG RP ER CL TE CH KA CE AM GE CA PO TO
			PG RP ER CL TE CH KA CE AM GE CA PO TO
			PG RP ER CL TE CH KA CE AM GE CA PO TO
			PG RP ER CL TE CH KA CE AM GE CA PO TO
			PG RP ER CL TE CH KA CE AM GE CA PO TO
			PG RP ER CL TE CH KA CE AM GE CA PO TO
			PG RP ER CL TE CH KA CE AM GE CA PO TO
			PG RP ER CL TE CH KA CE AM GE CA PO TO
			PG RP ER CL TE CH KA CE AM GE CA PO TO

COMMENTS:

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