

Bulletin of the
University of Minnesota Hospitals
 and
Minnesota Medical Foundation



**The Management of
 Staphylococcal Disease**

**Cumulative Index
 1948 - 1953**

BULLETIN OF THE
UNIVERSITY OF MINNESOTA HOSPITALS
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INDEX

	<u>PAGE</u>
I. THE MANAGEMENT OF STAPHYLOCOCCAL DISEASE	645 - 658
ROBERT I. WISE, M.D., Research Fellow,	
WESLEY W. SPINK, M.D., Professor,	
Department of Medicine,	
University of Minnesota Medical School	
II. MEDICAL SCHOOL NEWS	659 - 660
III. WEEKLY CALENDAR OF EVENTS	661 - 665
IV. TABLE OF CONTENTS: VOLUME XXIV, 1952-53	666 - 670
V. CUMULATIVE INDEX: 1948-1953	671 - 681

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I. THE MANAGEMENT OF STAPHYLOCOCCAL DISEASE

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Prior to the modern era of antibiotic therapy the lack of specific treatment for staphylococcal infections was reflected in the exceedingly high mortality rate for patients with septicemia, and the frequent suppurating and disabling disease that occurred in those individuals that recovered. Skinner and Keefer¹ documented a large series of cases of Staphylococemia occurring in the preantibiotic period, and pointed out that the mortality rate was 81.97 per cent. This high death rate was particularly applicable to adults over 30 years of age. The mortality rate of children with staphylococcal bacteremia was much lower, but chronic osteomyelitis of the long bones often occurred as a complication.

Studies on staphylococcal disease were initiated in the Department of Medicine in 1937. That also was the year when sulfanilamide first became available. There was no doubt that sulfanilamide, sulfapyridine, and particularly, sulfathiazole, suppressed the in vitro growth of Staphylococci. Sulfathiazole appeared to be of some value in the less serious staphylococcal diseases such as urinary tract infections. Initial observations indicated that sulfathiazole was quite beneficial in cases of staphylococcal bacteremia, but subsequent observations tempered this enthusiasm². The sulfonamides often failed to eradicate, or even to control Staphylococci in the tissues for at least two reasons. First, the exudate and the products of tissue necrosis inhibited the antistaphylococcal action of the sulfonamides. Second, the use of the sulfonamides was often followed by the appearance of sulfonamide-resistant Staphylococci³. A study of the nature of this resistance revealed that the resistant staphylococcal cells produced para-aminobenzoic acid which blocked the antistaphylococcal action of the sulfonamides⁴. The results of the management

of staphylococcal disease at the University Hospitals in the five-year period of 1937-1942, during which time the sulfonamides were available, demonstrated that well-timed surgical intervention for the drainage of suppurative lesions, especially for osteomyelitis of the long bones, was still of major importance in the recovery of patients. Additional factors that sustained the patient in his recovery were good nursing care and a sufficient caloric intake of food. The sulfonamides were utilized simultaneously, especially sulfathiazole, both locally and systemically. While the results of chemotherapy were difficult to quantitate, the drugs did appear to benefit some patients, but it became quite obvious that the sulfonamides were not the answer to the proper treatment of staphylococcal disease.

Limited supplies of penicillin were made available for investigations in 1942 through the National Research Council. Very fortunately, strains of Staphylococci isolated from patients before penicillin became available had been kept in the laboratory, and when the penicillin did arrive an opportunity presented itself in which to test the comparative in vitro effect of penicillin and sulfathiazole against 68 strains of coagulase-positive Staphylococci. Of considerable importance is the fact that while 28 per cent of these strains were highly resistant to sulfathiazole, not a single strain required 1 unit or more of penicillin to inhibit growth of the organisms⁵. While a slight degree of penicillin resistance was encountered with some strains, the resistance was inconsequential compared to what is being encountered today. Penicillin was administered for the first time at the University Hospitals to a 7 year old girl on July 11, 1942. She was desperately ill with staphylococcal bacteremia, pulmonary abscesses and acute osteomyelitis. While her recovery was remarkable in itself, of equal interest is the amount of penicillin that was used, all administered intravenously! She received 10,000 units of amorphous penicillin every 4 hours for 4 doses; 5000 units every 4 hours for 32 doses; 2500 units every 4 hours

for 20 doses; a total of 252,500 units in 15 days! During the period 1942-1944, 57 patients having staphylococcal disease were treated with penicillin⁶. There were 28 patients with staphylococcal bacteremia, and the over-all mortality rate was 28 per cent, which represented a precipitous drop from the 80 per cent rate of the prepenicillin days. It is of interest that even in adults the total dose of penicillin used rarely exceeded 1 million units. In view of the experience to date, it is now recognized that this mortality rate might very well have been reduced still further if larger doses of penicillin had been used. Further observations with penicillin therapy at the University Hospitals revealed gratifying results in the management of patients having staphylococcal meningitis⁷.

For more than five years after the introduction of penicillin into the University Hospitals, highly satisfactory results were obtained in the treatment of primary and secondary staphylococcal disease. This therapeutic success was reflected in the absence of chronic and suppurating staphylococcal infections, such as osteomyelitis, from the hospital beds. Three years after penicillin had been first used in the University Hospitals we stated that the appearance of penicillin-resistant strains of Staphylococci was a minor cause of failures with penicillin⁸. But there were rumblings in various parts of the world to the effect that penicillin-resistant strains of Staphylococci were appearing with increasing frequency, and that this was becoming a serious therapeutic problem. This also became quite apparent in 1948 and 1949 at the University and affiliated hospitals. More and more patients were being encountered who did not respond as satisfactorily to penicillin as previously, and a study of the organisms isolated from these individuals demonstrated a marked increase in the incidence of strains highly resistant to the *in vitro* action of penicillin. In the latter part of 1949 and beginning of 1950, an *in vitro* study was made of 104 strains of coagulase-positive Staphylococci isolated from patients

at the University Hospitals⁹. Over 50 per cent of these strains were found to be resistant to penicillin, and the resistance demonstrated by the vast majority of strains was extraordinarily high. Furthermore, a considerable number of these strains were also resistant to streptomycin. The interesting feature was that the degree of resistance that these strains manifested against aureomycin, oxytetracycline (terramycin) and chloramphenicol was negligible. At approximately the same time, similar results were reported from various other groups in the United States and from abroad.

When it became apparent that less than one-half of the patients with staphylococcal sepsis would respond satisfactorily to penicillin, more and more attention was turned toward aureomycin and oxytetracycline, and less so toward chloramphenicol. These antibiotics were initially highly effective in the therapy of staphylococcal disease, but then the problem of drug-resistant strains of Staphylococci began to manifest itself again. In 1952 another group of 100 strains of coagulase-positive Staphylococci isolated from patients at the University Hospitals was investigated for their *in vitro* sensitivity toward several antibiotics. It was shown that approximately 60 per cent of the strains were resistant to penicillin, with a similar degree of resistance manifested against streptomycin. But most significantly, it was now observed that up to 40 per cent of the strains were resistant to aureomycin, and to oxytetracycline. Fewer strains were resistant to chloramphenicol, and no resistant strains were encountered for bacitracin, erythromycin and carbomycin. A similar experience has been reported at the Mayo Clinic by Needham and Nichols¹⁰. In the latter part of 1951, approximately 60 per cent of the strains of Staphylococci isolated from patients manifested resistance to penicillin, and 36 per cent of these resistant strains were also resistant to aureomycin and to oxytetracycline. More recently, Finland and Haight¹¹ have studied 500 strains of Staphylococci isolated from material at the Boston City Hospital

during the latter part of 1951 and early part of 1952, and found that about 75 per cent were resistant to penicillin, and 25 per cent resistant to aureomycin and to oxytetracycline. Similarly, of 915 strains isolated from individuals in Sydney, Australia, 64.7 per cent were resistant to penicillin, and less so to aureomycin and oxytetracycline¹².

Without documenting the literature any further, it is apparent that all over the world in the larger centers where penicillin has been used extensively, an increasing number of strains of Staphylococci are being isolated that are resistant to penicillin. When clinicians then turned to other antibiotics, such as streptomycin, aureomycin and oxytetracycline, the same story of antibiotic resistance was repeated. The Staphylococcus appears to be the only bacterium that has rapidly produced progeny that are permanently resistant to penicillin and to other antibiotics. While the basic factors responsible for the appearance of resistant strains cannot be detailed here, it is generally accepted that penicillin, and the other antibiotics, have acted upon staphylococcal cells by selecting out the resistant variants, thus permitting these resistant cells to multiply, and killing off the more sensitive organisms. The resistant strains have then been kept going in the nasopharynx of healthy carriers, especially in hospital personnel. This epidemiologic factor explains the high incidence of cross infections

in patients in large hospitals with penicillin-resistant Staphylococci. Rountree and Thomson¹² surveyed the nasal carrier rate in 200 persons of a hospital staff and found that 54.5 per cent were carriers of Staphylococcus progenes. Eight of every 10 carriers were harboring penicillin-resistant strains. One of the most treacherous problems afflicting the larger hospitals today is that of cross infections from patient to patient and from staff to patient with highly penicillin-resistant strains of Staphylococci. And more and more of these strains harbored in the nasopharynx are manifesting resistance to several antibiotics.

Once again, staphylococemia has become a major problem in the University and affiliated hospitals. This report is concerned with 22 cases of staphylococcal bacteremia. At this time we wish to summarize the clinical features of these patients with particular reference to the bacteriology, complications, in vitro resistance studies with several antibiotics, and the results of therapy.

Since November 1951 to May 1953, a period of 18 months, 22 cases of severe staphylococcal sepsis have been studied at the University of Minnesota Hospitals, Minneapolis General Hospital and the Minneapolis Veterans Administration Hospital. Summaries of the cases are in Table I.

TABLE I

Summary of 22 Cases of Staphylococcal

Patient	Primary Disease	Portal of Entry	Complications	Blood Culture Bacteria per ml.
1. 8 yr. Male	Pyelonephritis	Genito-urinary system	Bacteremia	Positive
2. 26 yr. Female	Endocarditis Mitral valve	(Unknown)	Aortic insufficiency; pulmonary edema	Positive
3. 70 yr. Male	Prostatism Transurethral resection	Genito-urinary system	Bacteremia abscess	24
4. 42 yr. Male	Carcinoma of esophagus	Alimentary tract Esophagectomy	Bacteremia	Too many to count
5. 67 yr. Male	Carcinoma of esophagus	Alimentary tract Esophagectomy	Bacteremia	150
6. 77 yr. Male	Prostatism Transurethral resection	Genito-urinary system	Bacteremia	250
7. 38 yr. Male	Endocarditis	(Unknown)	Renal damage	(1) 3 (2) Too many to count

TABLE I (Cont.)

Sepsis Observed November 1951 - May 1953

In vitro Sensitivity Tests with Concentrations of Antibiotic* in Units or Micrograms Necessary to Inhibit Growth									Treatment in Order in Which Antibiotics Were Given			
Peni.	Strepto	Aureo	Oxytet	Chloro	Bacit	Erythro	Carbo	Neo.	Anti-biotic*	No. Days	Total Dose*	Result
7.8	>62.5	>62.5	62.5	7.8	1.0				Aureo.	3	3.0 gm	Re-
									Chloro.	8	12.0 gm	cov-
									Bacit.	9	180000 u	ered
									Peni.	17	20.4 ml	
									Sulfadiaz.	9	13.5 gm	
125.0	15.6	3.1	7.8	15.6	1.0	(0.5)	(1.9)	1.9	Aureo.	10	11.0 gm	Ex-
									Terra.	3	5.0 gm	pir-
									Peni.	11	21.0 ml	ed
									Strepto.	11	11.0 gm	
									Bacit.	8	800000 u	
									Peni.	2	40.0 ml	
15.6	>10,000	62.5	156.0	7.8	7.8	0.05	1.9	3.9	Aureo.	20	25.0 gm	Re-
									Terra.	4	8.0 gm	cov-
									Peni.	6	9.6 ml	ered
									Strepto.	10	20.0 gm	
									Chloro.	10	20.0 gm	
									Erythro.	17	20.4 gm	
2000.	>10,000	62.5	62.5	7.8	0.5	0.5	1.9	3.9	Peni.	45	46.4 ml	Ex-
									Strepto.	34	34.0 gm	pir-
									Aureo.	32	32.0 gm	ed
									Terra.	25	25.0 gm	
									Chloro.	4	4.0 gm	
									Erythro.	21	25.2 gm	
									Bacit.	5	150000 u	
>15.6	62.5	0.5	62.5	Resis. Sens.					Peni.	12	9.0 ml	Ex-
									Strepto.	12	21.0 gm	pir-
									Sulfadiaz.	4	24.0 gm	ed
									Bacit.	2	160000 u	
>15.6	>62.5	>62.5	>62.5		0.5	0.5			Aureo.	11	10.5 gm	Ex-
									Peni.	25	151.5 ml	pir-
									Strepto.	21	29.0 gm	ed
									Terra.	11	22.0 gm	
									Bacit.	7	420000 u	
									Erythro.	5	6.0 gm	
6.3	12.5	3.1	1.5	12.5	3.1	0.38	1.9	1.5	Carbo.	11	46.0 gm	Not
									Terra.	3	1.5 gm	im-
									Erythro.	114	228.0 gm	prov-
									Peni.	75	286.8 ml	ed
									Bacit.	3	240000 u	

TABLE I (Cont.)

Patient	Primary Disease	Portal of Entry	Complications	Blood Culture Bacteria per ml.
8. 48 yr. Female	Septic arthritis	(Unknown)	Bacteremia	(1) 2 (2) 19
9. 47 yr. Male	Endocarditis	Abscess of neck	Myocardial abscess Multiple abscesses	(1) 6 (2) Too many to count
10. 38 yr. Male	Endocarditis Cirrhosis	(Unknown)	Congestive failure Anemia	(1) 3 (2) Too many to count
11. 22 yr. Female	Endocarditis Aortic valve	Abscess of hand	Congestive failure	Positive 4 X
12. 48 yr. Female	Intestinal obstruction	Indwelling plastic tube in vein	Bacteremia	Positive 3 X
13. 21 yr. Male	Staphylococcus septicemia	(Unknown)	Septic arthritis Vitreous abscess	Positive 4 X
15. 61 yr. Male	Rheumatoid arthritis Cortisone Endocarditis Mitral valve	(Unknown)	Rupture of mitral valve. Pericarditis. Abscesses. Meningo-encephalitis	600
16. 38 yr. Male	Lymphoblastoma Duodenal ulcer	Indwelling plastic tube in vein	Bacteremia Abscesses of myocardium, lungs, liver, spleen. Pyelonephritis Pericarditis	Positive

TABLE I (Cont.)

Peni.	Strepto	Aureo	Oxytet	Chloro	Bacit	Erythro	Carbo	Neo.	Anti biotic*	No. Days	Total Dose*	Result
50.0	12.5	1.5	1.5	12.5	1.5	0.75	1.0	1.5	Peni. Terra. Strepto. Carbo. Erythro. Bacit. Neo.	36 55 10 3 23 20 19	25.2 ml 110.0 gm 10.0 gm 6.0 gm 27.6 gm 1.2 ml 14.25gm	Re- cov- ered
0.09	3.1	1.5	1.5	12.5	0.75	0.38	0.75	0.75	Peni. Terra. Aureo. Carbo. Erythro.	23 2 1 4 12	134.0 ml 3.0 gm 0.25gm 18.4 gm 24.0 gm	Ex- pir- ed
0.09	1.5	0.75	0.75	6.3	1.5	0.19	0.75	1.5	Carbo. Peni. Bacit. Erythro.	7 57 4 36	32.8 gm 342.0 gm 320000 u 72.0 gm	Not im- prov- ed
0.38	12.5	1.5	1.5	12.5	1.5	0.38	0.75	0.09	Peni. Erythro. Carbo. Terra.	22 5 6 1	96.3ml.u 6.0 gm 24.0 gm 3.0 gm	Ex- pir- ed
1250.	>10,000	7.8	31.2	31.2	1.0	0.25	1.0	3.9	Peni. Strepto. Aureo. Carbo. Bacit.	4 6 4 27 22	3.2ml.u 6.0 gm 4.0 gm 51.0 gm 880000 u	Re- cov- ered
<0.5	>62.5	3.9	15.6	7.8	15.6	0.5	0.25	3.9	Bacit. Carbo.	1 15	25,000 u 45.0 gm	Re- cov- ered
0.5	7.8	1.9	3.9	7.8	7.8	<0.5	1.9	15.6	Peni. Terra.	2 2	16 ml.u 4 gm	Ex- pir- ed
>2000	>10,000	31.2	156.0	7.8	31.2	1.9	1.9	15.6	Gantrisin Neo. Peni. Strepto. Terra. Erythro. Carbo. Bacit.	6 1 16 9 11 5 5 2	24 gm 4 gm 38.2 ml 18.0 gm 11.0 gm 8.0 gm 1.5 gm 80,000 u	Ex- pir- ed

TABLE I (Cont.)

Patient	Primary Disease	Portal of Entry	Complications	Blood Culture Bacteria per ml.
19. 78 yr. Female	Staphylococcus pneumonia	Respiratory system	Bacteremia	Positive
20. 63 yr. Male	Multiple myeloma Treatment urethane	(Unknown)	Bacteremia	125
21. 42 yr. Male	Lymphoblastoma	(Unknown)	Bacteremia	(1) 4 (2) 176
22. 29 yr. Male	Ureteral calculus Right ureteral lithotomy	Ureteral lithotomy wound	Bacteremia	Positive ?
23. 44 yr. Female	Carcinoma of cervix with metastasis Cholecystectomy Abd. fistulae	Recto-vaginal fistula	Bacteremia	(1) Positive (2) 2
24. 33 yr. Male	Lymphosarcoma	Indwelling plastic tube in vein	Bacteremia Thrombo-phlebitis	
25. 72 yr. Male	Osteomyelitis of hip	(Unknown)	Bacteremia	Positive ?

TABLE I (Cont.)

Peni.	Strepto	Aureo	Oxytet	Chloro	Bacit	Erythro	Carbo	Neo.	Anti-biotic*	No. Days	Total Dose*	Result
>50.0	>50.0	>50.0	>50.0	6.3	3.1	0.38	1.5	3.1	Peni. Terra. Erythro. Bacit.	9 9 23 8	6.0 ml 14.0 gm 46.0 gm 640000 u	Re-cov-ered
>15.6	>62.5	3.9	62.5	7.8	0.25	1.9	1.9	7.8	Peni. Strepto. Aureo. Terra.	9 9 2 2	14.4 ml 18.0 gm 2.0 gm 2.8 gm	Ex-pir-ed
>100.	Resis.	0.39	0.39	Resis.	6.25	1.56			Peni. Strepto. Erythro. Terra.	36 14 9 8	43.2 ml 20.0 gm 7.2 gm 13.0 gm	Ex-pir-ed
>100	Resis.	100.	100.	6.3	1.56	0.78			Peni. Aureo. Erythro. Terra.	6 3 20 2	1.8 ml 6.0 gm 22.8 gm 1.0 gm	Re-cov-ered
>500	>62.5	125.	125.	3.1	0.5	0.25	1.9	3.9	Sulfasuxi Aureo. Peni. Strepto. Bacit. Neo. (0) Erythro. Terra.	8 13 17 11 5 16 26 4	64.0 gm 13.0 gm 13.5 ml 11.0 gm 400000 u 36.0 gm 49.2 gm 4.0 gm	Im-prov-ed of infec. Expir-ed of pri. dis-ease
>62.5	>62.5	7.8	62.5	7.8	0.25	1.0	3.9	7.8	Aureo. Terra. Strepto. Peni. Bacit.IM ErythroIV	12 9 3 3 1 5	3.6 gm 9.0 gm 3.0 gm 6.0 ml.u 80,000 u 5.0 gm	Ex-pir-ed
>50.0	12.5	1.5	.75	12.5	3.1	.38	0.75	1.5	Peni Terra. Erythro. Bacit.			Not im-prov-ed

* ABBREVIATIONS:

Peni. - Penicillin	Carbo. - Carbomycin (Magnamycin)
Strepto. - Streptomycin	Neo. - Neomycin
Aureo. - Aureomycin	Sulfadiaz. - Sulfadiazine
Oxytet. - Oxytetracycline (Terramycin)	Sulfasuxi. - Sulfasuxidine
Chloro. - Chloramphenicol (Chloromycetin)	ml - - million units
Bacit. - Bacitracin	u - - units
Erythro. - Erythromycin	gm - - grams

Age Distribution

The ages of the patients are presented in the following table:

TABLE II

<u>Age in Years</u>	<u>Number of Cases</u>
1-10	1
10-20	0
20-30	4
30-40	4
40-50	6
50-60	0
60-70	4
70-80	3

Most of the cases represented adults which is not an accurate distribution of cases of staphylococcal sepsis. This disparity in the present series is due to the fact that all of the cases from the Pediatrics Services are not included. There were 16 males and 6 females.

The portals of entry in some of the cases were difficult to determine; however, in some cases a specific site was indicated. These are presented in Table III.

TABLE III

<u>Portal of Entry</u>	<u>No. of Cases</u>
Abscess of hand	1
Abscess of neck	1
Infection at site of insertion of polyethylene catheter into vein	3
Alimentary tract	2
Genito-urinary system	3
Pyelonephritis	1
Post-transurethral resection	2
Respiratory tract	1
Operative wound, ureteral lithotomy	1
Rectovaginal fistula	1
Unknown	9

In 2 of the 6 patients with endocarditis, abscesses of the skin were present. In the patients with thrombophlebitis near the insertion of plastic tubes, Staphylococci were cultured from the sites in 2 cases.

Primary Disease Preceding Staphylococcal Infection

Most of the patients had other associated diseases which preceded the onset of sepsis. In many instances this very likely contributed to the high mortality rate in the present series of cases. Some of the associated diseases are as follows:

TABLE IV

<u>Primary Disease</u>	<u>No. of Cases</u>
Arthritis, Charcot's joint	1
Rheumatoid arthritis undergoing cortisone therapy	1
Carcinoma of cervix with metastasis and abdominal fistulae	2
Carcinoma of esophagus, esophagectomy	2
Intestinal obstruction, multiple operations	1
Lymphoblastoma	2
Lymphosarcoma	1
Multiple myeloma	1
Fracture of hip	1
Transurethral resection of prostate	2
Respiratory infection, influenza	1
Pyelonephritis	1
Ureteral lithotomy	1

Antibiotic Resistance

The cultures, which were isolated from the patients, were tested in vitro for sensitivity to the antibiotics. They were considered to be resistant if the culture grew in 3.1 or more units or micrograms of antibiotic per ml. The results are shown in Table V.

TABLE V

Results of in vitro Sensitivity Tests of the Cultures (Isolated from patients) to the Antibiotics, Showing Sensitivity Ranges and Percentage of Cultures Resistant to 3.1 or More Units or Micrograms of Antibiotics per Ml.

Total No. Cultures	Antibiotic	No. of Cultures Inhibited by Each Concentration Range in Units or Micrograms of Antibiotic per Ml.				% Resistant* to 3.1 or More
		<1.0	1.5-3.1	3.9*	6.3-15.6 >15.6	
22	Penicillin	5		2	15	77.2
22	Streptomycin		2	6	14	95.4
22	Aureomycin	2	9	3	8	63.6
22	Oxytetracycline	3	6	1	12	68.1
21	Chloramphenicol		1	17	3	100.0
22	Bacitracin	10	7	4	1	36.3
20	Erythromycin	17	3			0
17	Carbomycin	7	10			5.8
17	Neomycin	2	11	4		52.9

*Two different dilution techniques were used, one resulting in dilution of 3.1 and the other 3.9.

The cultures were very resistant to penicillin and streptomycin. Some of the patients developed staphylococcal sepsis while undergoing therapy with these antibiotics. In cases 3, 4, 12 and 16 of Table I the isolated Staphylococci grew in broth containing 10,000 mcgm. of streptomycin per ml. In the case of oxytetracycline and aureomycin there was increased resistance of 68 and 64 per cent respectively. All of the strains were resistant to chloramphenicol. But it should be pointed out that the resistance for chloramphenicol was not beyond that which might be overcome therapeutically, although this drug has not been too effective in cases of staphylococcal sepsis. Eight of the 22 strains were resistant to bacitracin. However, the amounts necessary for bacteriostasis was over 15.6 units per ml. in only one instance. Erythromycin and carbomycin were similar and equally effective in the in vitro studies. In one case 3.9 mcgm. of carbomycin was necessary for bacteriostasis.

Report of Cases

Case #3. , a 70 year old white male was admitted to the University Hospital April 8, 1952 with acute urinary retention and history of alcoholism and prostatism of one year. Shortly after admission he developed fever which improved following treatment with penicillin, streptomycin and aureomycin. A transurethral resection of the prostate was performed on April 16, 1953 which was followed by shock, chills and fever. He improved and became afebrile during treatment for 5 days with penicillin, streptomycin and aureomycin. Severe diarrhea and jaundice occurred during therapy and subsided. He was discharged 14 days after discontinuance of therapy.

Eight days later he was readmitted with chills and fever. His temperature subsided during therapy with penicillin, dihydrostreptomycin and chloromycetin and he was discharged after 6 days.

The third admission was 4 days later

with chills and fever. Three consecutive blood cultures were positive for coagulase-positive hemolytic Staphylococcus aureus with 24 bacteria per ml. of blood. He did not respond to aureomycin. Sensitivity studies revealed the culture to be very resistant to streptomycin, terramycin, aureomycin and penicillin, but very sensitive to erythromycin. He was treated with erythromycin with satisfactory response. An abscess of the right deltoid area was found to contain Staphylococci. The abscess and blood became sterile and the patient was discharged June 25, 1952. No relapse occurred during one month out-patient follow up.

Case #9. ., a 47 year old white male roofer was admitted to Minneapolis General Hospital on December 19, 1952 and expired on January 11, 1953. He had a history of alcoholism and an abscess of the neck 2 weeks prior to admission. Four days prior to admission he developed headache, malaise and fever. Mental confusion occurred with hallucinations and periods of unresponsiveness. No history of rheumatic fever was known.

Physical examination revealed T. 103; P. 144; B.P. 130/98; disorientation; petechial hemorrhages of extremities, buccal mucosa and right eye, and splenomegaly. An aortic diastolic murmur was heard on the 4th day.

Six consecutive blood cultures revealed too many colonies to count of coagulase-positive hemolytic Staphylococcus aureus. WBC was 43,200 with 95% neutrophils. The organism was sensitive to the antibiotics. except chloromycetin. He was treated with penicillin, 6 million units per day; with carbomycin for 5 days and then with erythromycin for 11 days. Temperature remained elevated. He developed a paralysis of the left arm. Pulmonary edema developed suddenly on the 18th hospital day and he expired.

Autopsy revealed acute pulmonary edema, endocarditis with a ruptured aortic valve, and abscesses of the myocardium, meninges, liver, spleen and kidneys.

Case #12. ., a 48 year old white

married female admitted to University Hospital November 24, 1952 with a fecal fistula, a Miller-Abbot tube in the small bowel and symptoms of intestinal obstruction and a history of recurrent intestinal obstruction, two laparotomies, wound disruption and the ileum being inadvertently opened in 3 places with development of a fistula. Physical examination revealed T. 100; P. 108; a Grade II systolic murmur at the apex and the fecal fistula. X-ray studies revealed evidence of a mechanical obstruction of the small bowel. Surgical repair was done and she received penicillin and streptomycin. During therapy she developed edema of the left leg and an ileo-femoral thrombosis with chills and fever. Blood cultures on 3 successive days revealed coagulase-positive hemolytic Staphylococcus aureus. The culture grew in 10,000 mcgm./ml. of streptomycin and required 1250 units per ml. of penicillin to inhibit it. She was treated with bacitracin and carbomycin with good response except that the sedimentation rate remained elevated. She was discharged. Three months later an abscess in the right hip area was drained and Staphylococci were isolated. She was well at last report 4 months following discharge.

Case #15. ., a 61 year old white male was admitted to the University Hospital on April 4, 1952 and expired the next day. He had rheumatoid arthritis of many years duration and had received cortisone for 19 months, taking 62.5 mg. daily. Chills and fever had started 3 days prior to admission. He was observed to be acutely ill with labored respirations; T. 103; R. 32; P. 136; B.P. 88/60; petechiae of conjunctiva; coarse pulmonary ronchi and loud harsh systolic murmur. Blood culture revealed 600 bacteria per ml. of blood. He received penicillin in high dosage and terramycin. At autopsy he was found to have endocarditis with perforation of the mitral valve, fibro purulent pericarditis, multiple hemorrhages of the kidney, an abscess in the right anterior chest wall and suppurative meningo-encephalitis.

Case #19. ., a 78 year old female was admitted to Minneapolis General Hos-

pital on February 9, 1953 and was discharged on March 21, 1953. Two weeks prior to admission she had developed cough, dyspnea, anorexia, generalized aches, chills, fever and pleuritic pain for which she had received one injection of penicillin and two penicillin tablets daily for 6 days without improvement. She had a history of a coronary thrombosis 5 years before. Physical examination revealed T.104; P. 112; R. 24; B.P. 134/70. She was restless, groaning, hot and dehydrated with injected sclera and physical signs of a pneumonic process in the right lower chest. X-ray revealed pneumonia in the base of the right lung. Two blood cultures and a sputum culture revealed coagulase-positive hemolytic Staphylococcus aureus. She was treated with penicillin and terramycin. On the 13th hospital day, a chest x-ray revealed multiple areas of infiltration interpreted as necrotizing pneumonitis which were probably abscesses. Treatment was changed to bacitracin and erythromycin with improvement.

Results of Therapy

Of the 22 cases studied, 7 have recovered and show no signs of infection. One of them (Case #11, Table I) had an amputation of a leg because of the persistence of a suppurative focus, and one (Case #13) lost most of his vision. Three cases (Cases #7, 10 and 25) are in the process of being treated. Two of these have been treated with antibiotics for over 6 months. In one of these (Case #7) therapy with the antibiotics was discontinued after the patient was 100 days without fever, but within 6 days he became febrile and blood cultures revealed too many colonies of bacteria to count. The prognosis of the 3 patients now undergoing therapy is poor.

Twelve of the patients have expired, a mortality rate of approximately 54%. One who expired (Case #23) appeared to be cured of her staphylococcal infection but died because of the primary disease and probable myocardial infarction.

It has been observed in a number of these cases that relapses frequently occur even after the patient has been afebrile

for several days or many weeks. One of the best indications for insufficient therapy and a continued infection has been an elevated sedimentation rate.

An analysis of therapy used in these patients suggests that the best results were obtained when penicillin was used in combination with bacitracin, or when erythromycin or carbomycin was administered simultaneously with bacitracin.

Recommended Therapy for Severe Staphylococcal Sepsis

It is difficult to lay down hard and fast rules for the therapy of staphylococcal infections, and the following is offered only because experience to date has indicated that such treatment is effective. Penicillin is still the antibiotic of choice for the treatment of staphylococcal disease, providing the causative strain displays in vitro sensitivity. Under these circumstances the following is suggested:

A total daily dose of at least 2 to 4 million units of crystalline G penicillin in aqueous solution administered intramuscularly in divided doses every 4 hours. In addition, "booster doses" of 1 million units in 10 ml. of saline solution may be administered intravenously every 12 hours. Such therapy should be continued for a minimum of 2 weeks in severe cases. If the patient has normal renal function, small doses of bacitracin may be used simultaneously, but a total daily dose of 100,000 units should not be exceeded, and the urine should be examined daily for evidence of albuminuria. The bacitracin may be given intramuscularly in divided doses every six hours. Therapy with bacitracin should be discontinued if nitrogen retention appears.

If the causative organism exhibits resistance to penicillin, it is suggested that erythromycin should be used in a total daily dose of 2 to 3 gms. given orally in divided doses every 6 hours. Again, if normal renal function is present, bacitracin may be used simultaneously as described above.

Other agents that are effective and can be used in selected cases include aureomycin and oxytetracycline, as well as carbomycin. Dihydrostreptomycin and streptomycin are not highly desirable for long term use because of the appearance of resistant variants, but in selected cases these drugs can be effectively used along with penicillin or any of the other agents mentioned above.

It might appear superfluous to mention as additional therapeutic procedures good nursing care, adequate dietary intake, and the surgical drainage of approachable suppurative areas, but attention to these details may mean the difference between ultimate recovery and chronic disease, or even death.

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Arch. Int. Med., 91:143, Feb. 1953.
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Incidence of antibiotic-resistant *Staphylococci* in a hospital.
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II. MEDICAL SCHOOL NEWS

Coming Event

July 1 Family Doctors' Day; Division of Psychiatry; 12:00 Noon; Powell Hall Recreation Lounge.

* * *

Progress Report

Last year's skeleton has taken on body and form. As the Mayo Memorial Building approaches completion, it forms an increasingly predominant portion of the campus silhouette. Structural steel is now completely covered with brick. Several of the more intrepid members of our faculty have climbed to the top of the structure and have informed the Editor that the view is magnificent. We are all anxiously awaiting the opening of the building, scheduled for April, 1954.

* * *

Doctors Ebert and Chapman to Leave

The Department of Medicine will lose two of its most outstanding teachers and investigators in the field of cardiology during the summer months. Dr. Richard V. Ebert, Clark Professor of Medicine for the past year, will become Professor of Medicine at the Northwestern University School of Medicine on September 1. He will also be Chief of Medicine at the Veterans Research Hospital in Chicago.

Dr. Carleton B. Chapman, Associate Professor of Medicine, will leave at the end of the first summer session to become Professor of Medicine at Southwestern Medical School in Dallas, Texas, where Dr. George N. Aagaard, formerly Director of the Department of Continuation Medical Education and Editor of the Bulletin, is now Dean.

The loss of two such capable people is regretted by the entire faculty. However, we naturally join in offering our congratulations and best wishes to both of them on their new appointments. We are glad that they have been with us even if for an all too brief period.

* * *

Faculty News

Dr. A. B. Baker, Professor, Department of Psychiatry and Neurology and Director, Division of Neurology, will attend the American Neurological Association Meetings in Atlantic City from June 15 to 18 where he will participate in a discussion on neurological education.

At the Annual Cascade County Medical-Surgical Conference at Great Falls, Montana, on June 22 and 23, Dr. Wesley W. Spink, Professor, Department of Medicine, will present two papers on, "The Present Status of Antibiotic Therapy" and "The Management of Patients with Fever of Undetermined Etiology."

Dr. Donald W. Cowan, Associate Professor of Public Health and Assistant Director, Students' Health Service, is leaving this week for Belfast, Ireland, where he will spend several weeks at the university in exchange with Dr. Wilson Johnston who will be coming to the University of Minnesota to observe methods here. Dr. Cowan will also tour the European continent.

Dr. Ramona Todd, Associate Professor of Public Health, has resigned from the University faculty to accept a position in San Francisco with the California State Board of Health.

The University of Minnesota, together with the Minnesota State Medical Association, has sponsored a television program entitled, "How's Your Health?" on which have appeared several members of the full-time staff including: Doctors Richard V. Ebert, Richard L. Varco, Ancel Keys, Robert G. Hinckley, Donald W. Cowan, Robert B. Howard, and John J. Bittner. Clinical members of our faculty who have also participated in these programs are as follows: Doctors C. J. Ehrenberg, O. J. Campbell, Phillip F. Donohue, C. J. Holmberg, and Eugene Rames. Dr. James Rogers Fox, Instructor, School of Public Health, and Physician, Students' Health Service, has been the chairman and moderator of this television program.

Dr. Fox, has also presented several lectures recently. At "Health Day" in Duluth, which was sponsored by the St. Louis County Medical Society, Dr. Fox discussed, "Common Medical Problems." At a Medical Forum in St. Paul he talked on "The Panel System in Great Britain." "The Health Plan in Great Britain" was his topic at the meeting of the American Society of Dentistry for Children, and he talked at the meeting of the Minneapolis P.T.A. on "The Parent's Responsibility for the Health of the Child."

* * *

Thank You, Elva Lavers

After a full year as Editor of the Bulletin, we have come to appreciate even more than ever the outstanding cooperation and interest in its publication manifested by Miss Elva Lavers and her staff. We regret the many inconveniences we have caused them due to delays, changes, and special tables and graphs. We hasten to assure them, however, that their efforts are not unappreciated. Once again, then, Miss Lavers, many thanks to you and your colleagues.

* * *

Summer Best Wishes

With this issue the "Bulletin of the University of Minnesota Hospitals and Minnesota Medical Foundation" ceases publication until next fall. Once again, we have had a series of papers of real interest and originality. Readership of the Bulletin has continued to increase, and today it is found in a good many medical libraries throughout the nation. The faculty is to be commended for the increasingly high quality of the publication.

To students, faculty, and friends of the Medical School and to all members of the Minnesota Medical Foundation, we extend best wishes for the summer season. We look forward to the relaxing activities of the summer months and beyond that to the resumption of full-scale activities next fall.

III.

UNIVERSITY OF MINNESOTA MEDICAL SCHOOL
WEEKLY CALENDAR OF EVENTS

Physicians Welcome

June 15 - 20, 1953

Monday, June 15

Medical School and University Hospitals

- 9:00 - 9:50 Roentgenology-Medicine Conference; L. G. Rigler, C. J. Watson and Staff; Todd Amphitheater, U. H.
- 9:00 - 10:50 Obstetrics and Gynecology Conference; J. L. McKelvey and Staff; W-612, U. H.
- 10:00 - 12:00 Neurology Rounds; A. B. Baker and Staff; Station 50, U. H.
- 11:30 - Tumor Conference; Doctors Kremen, Moore, and Stenstrom; Todd Amphitheater, U. H.
- 12:15 - Obstetrics and Gynecology Journal Club; Staff Dining Room, U. H.
- 1:30 - 2:30 Pediatric-Neurological Rounds; R. Jensen, A. B. Baker and Staff; U. H.
- 4:30 - ECG Reading Conference; James C. Dahl, et al; Staff Room, Heart Hospital.
- 4:30 - Public Health Seminar; 15 Owre Hall.
- 4:30 - 6:00 Physiology 114A and Cancer Biology 140 -- Research Conference on Cancer, Nutrition, and Endocrinology; Drs. Visscher, Bittner, and King; 129 Millard Hall.
- 5:00 - 6:00 Urology-Roentgenology Conference; C. D. Creevy, O. J. Baggenstoss, and Staff; Eustis Amphitheater.

Ancker Hospital

- 8:30 - 10:00 Tuberculosis and Chest Conference; Auditorium.
- 2:00 - 3:00 Surgery Journal Club; Classroom.

Minneapolis General Hospital

- 9:30 - Pediatric Rounds; Eldon Berglund; Newborn Nursery, Station C.
- 10:30 - 12:00 Tuberculosis and Contagion Rounds; Thomas Lowry; Station M.
- 11:00 - Pediatric Rounds; Erling Platou; Station K.
- 12:30 - Surgery Grand Rounds; Dr. Zierold; Sta. A.
- 1:00 - X-ray Conference; Classroom, 4th Floor.
- 2:00 - Pediatric Rounds; Robert A. Ulstrom; Stations I and J.

Veterans Administration Hospital

- 1:30 - Cardiac Rounds; Drs. Ebert and Berman, and Richards.

Tuesday, June 16

Medical School and University Hospitals

- 9:00 - 9:50 Roentgenology-Pediatric Conference; L. G. Rigler, I. McQuarrie and Staff; Eustis Amphitheater, U. H.
- 9:00 - 12:00 Cardiovascular Rounds; Station 30, U. H.
- 12:30 - 1:20 Pathology Conference; Autopsies; J. R. Dawson and Staff; 102 I. A.
- 12:30 - 1:30 Physiology 114D -- Current Literature Seminar; 129 Millard Hall.
- 4:00 - 5:00 Pediatric Rounds on Wards; I. McQuarrie and Staff; U. H.
- 4:30 - 5:30 Clinical-Medical-Pathological Conference; Todd Amphitheater, U. H.
- 4:30 - ECG Reading Conference; James C. Dahl, et al; Staff Room, Heart Hospital.

Ancker Hospital

- 9:00 - 10:00 Medical X-ray Conference; Auditorium.

Minneapolis General Hospital

- 10:00 - Pediatric Rounds; Spencer F. Brown; Stations I and J.
- 10:30 - 12:00 Medicine Rounds; Thomas Lowry and Staff; Station F.
- 12:30 - Grand Rounds; Fractures; Willard White, et al; Sta. A.
- 12:30 - Neuroroentgenology Conference; O. Lipschultz, J. C. Michael and Staff.
- 12:30 - EKG Conference; Boyd Thomes and Staff; 302 Harrington Hall.
- 1:00 - Tumor Clinic; Drs. Eder, Cal, and Lipschultz.
- 1:00 - Neurology Grand Rounds; J. C. Michael and Staff.

Veterans Administration Hospital

- 7:30 - Anesthesiology Conference; Conference Room, Bldg. I.
- 8:45 - Surgery Journal Club; Conference Room, Bldg. I.
- 9:30 - Infectious Disease Rounds; Drs. Hall and Zinneman.
- 9:30 - Surgery-Pathology Conference; Conference Room, Bldg. I.
- 10:30 - Surgery-Tumor Conference; L. J. Hay, J. Jorgens; Conference Room, Bldg. I.
- 1:00 - Review of Pathology, Pulmonary Tuberculosis; Conference Room, Bldg. I.
- 1:30 - Combined Medical-Surgical Chest Conference; Conference Room, Bldg. I.
- 2:00 - 2:50 Dermatology and Syphilology Conference; H. E. Michelson and Staff; Bldg. III.

Wednesday, June 17

Medical School and University Hospitals

- 8:00 - 9:00 Roentgenology-Surgical-Pathological Conference; Paul Lober and L. G. Rigler; Todd Amphitheater, U. H.

Wednesday, June 17 (Cont.)

Medical School and University Hospitals (Cont.)

- 11:00 - 12:00 Pathology-Medicine-Surgery Conference; Surgery Case; O. H. Wangensteen, C. J. Watson and Staffs; Todd Amphitheater, U. H.
- 12:30 - 1:30 Physiology 114C -- Permeability and Metabolism Seminar; Nathan Lifson; 129 Millard Hall.
- 1:30 - 3:00 Physiology 114B -- Circulatory and Renal System Problems Seminar; Dr. M. B. Visscher, et al; 214 Millard Hall.
- 4:30 - ECG Reading Conference; James C. Dahl, et al; Staff Room, Heart Hospital.
- 5:00 - 5:50 Urology-Pathological Conference; C. D. Creevy and Staff; Eustis Amphitheater.
- 8:00 - 10:00 Dermatological-Pathology Conference; Review of Histopathology Section; R. Goltz; Todd Amphitheater, U. H.

Ancker Hospital

- 8:30 - 9:30 Clinico-Pathological Conference; Auditorium.
- 12:30 - 1:30 Medical Journal Club; Library.

Minneapolis General Hospital

- 9:30 - Pediatric Rounds; Max Seham; Stations I and J.
- 10:30 - 12:00 Medicine Rounds; Thomas Lowry and Staff; Station D.
- 11:00 - Pediatric Seminar; Arnold Anderson; Classroom, Station I.
- 11:00 - Pediatric Rounds; Erling S. Paltou; Station K.
- 12:00 - Surgery-Physiology Conference; Dr. Zierold and Dr. E. B. Brown; Classroom.
- 12:15 - Pediatric Staff Meeting; Classroom, Station I.
- 1:30 - Visiting Pediatric Staff Case Presentation; Station I, Classroom.

Veterans Administration Hospital

- 8:30 - 10:00 Orthopedic X-ray Conference; E. T. Evans and Staff; Conference Room; Bldg. I.
- 8:30 - 12:00 Neurology Rehabilitation and Case Conference; A. B. Baker
- 9:00 - Gastro-Intestinal Rounds; Drs. Wilson, Nesbitt, Zieve, Hay and Goodnow.
- 12:30 - X-ray Conference; J. Jorgens; Conference Room, Bldg. I.
- 1:30 - 2:30 Infectious Disease Conference; Wesley W. Spink; Conference Room, Bldg. I.
- 2:30 - 4:00 Infectious Disease Rounds; Main Conference Room, Bldg. I.
- 7:00 p.m. Lectures in Basic Science of Orthopedics, Conference Room, Bldg. I.

Thursday, June 18

Medical School and University Hospitals

- 8:00 - 9:00 Vascular Rounds; Davitt Felder and Staff Members from the Departments of Medicine, Surgery, Physical Medicine, and Dermatology; Heart Hospital Amphitheater.
- 9:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; E-221, U. H.

Thursday, June 18 (Cont.)

Medical School and University Hospitals (Cont.)

- 11:00 - 12:00 Cancer Clinic; K. Stenstrom and A. Kremen; Todd Amphitheater, U. H.
1:30 - 4:00 Cardiology X-ray Conference; Heart Hospital Theatre.
4:00 - 5:00 Physiology-Surgery Conference; Todd Amphitheater, U. H.
4:30 - ECG Reading Conference; James C. Dahl, et al; Staff Room, Heart Hospital.
7:30 - 9:30 Pediatric Cardiology Conference and Journal Club; Review of Current Literature 1st hour and Review of Patients 2nd hour; 206 Temporary West Hospital.

Ancker Hospital

- 8:00 - 10:00 Medical Grand Rounds; Auditorium.

Minneapolis General Hospital

- 9:30 - Neurology Rounds; Heinz Bruhl; Station I.
10:00 - Pediatric Rounds; Spencer F. Brown; Station K.
10:00 - Psychiatry Grand Rounds; J. C. Michael and Staff; Sta. H.
11:30 - 12:30 Clinical Pathological Conference; John I. Coe; Classroom.
1:00 - Fracture - X-ray Conference; Dr. Zierold; Classroom.
1:00 - House Staff Conference; Station I.
2:00 - 4:00 Infectious Disease Rounds; Classroom.
4:00 - 5:00 Infectious Disease Conference; Wesley W. Spink; Classroom.

Veterans Administration Hospital

- 8:00 - Surgery Grand Rounds; Conference Room, Bldg. I.
8:00 - Surgery Ward Rounds; Lyle Hay and Staff; Ward 11.
11:00 - Surgery-Roentgen Conference; J. Jorgens; Conference Room, Bldg. I.
1:00 - 3:00 Metabolic Disease Conference; Drs. Flink, Heller, Jacobson, and Bolin.

Friday, June 19

Medical School and University Hospitals

- 8:00 - 10:00 Neurology Grand Rounds; A. B. Baker and Staff; Station 50, U. H.
9:00 - 9:50 Medicine Grand Rounds; C. J. Watson and Staff; Todd Amphitheater, U. H.
10:00 - 11:00 Pediatric Grand Rounds; Irvine McQuarrie and Staff; Eustis Amphitheater, U. H.
10:30 - 11:50 Medicine Rounds; C. J. Watson and Staff; Todd Amphitheater, U. H.
10:30 - 1:50 Otolaryngology Case Studies; L. R. Boies and Staff; Out-Patient Department, U. H.
1:00 - 2:50 Neurosurgery-Roentgenology Conference; W. T. Peyton, Harold O. Peterson and Staff; Todd Amphitheater, U. H.
3:00 - 4:00 Neuropathological Conference; F. Tichy; Todd Amphitheater, U. H.
4:00 - 5:00 Physiology 124 -- Seminar in Neurophysiology; Ernst Gelhorn; 113 Owre Hall.

Friday, June 19 (Cont.)

Medical School and University Hospitals (Cont.)

- 4:30 - 5:20 Ophthalmology Ward Rounds; Erling W. Hansen and Staff; E-534, U. H.
- 4:30 - ECG Reading Conference; James C. Dahl, et al; Staff Room, Heart Hospital.
- 5:00 - Urology Seminar and X-ray Conference; Eustis Amphitheater, U. H.

Ancker Hospital

- 1:00 - 3:00 Pathology-Surgery Conference; Auditorium.

Minneapolis General Hospital

- 9:30 - Pediatric Rounds; Wallace Lueck; Station J.
- 10:30 - Pediatric Surgery Conference; Oswald Wyatt, Tague Chisholm; Station I, Classroom.
- 12:00 - Surgery-Pathology Conference; Dr. Zierold, Dr. Coe; Classroom.
- 1:00 - 3:00 Clinical Medical Conference; Thomas Lowry; Classroom, Station M.
- 1:15 - X-ray Conference; Oscar Lipschultz; Classroom, Main Bldg.
- 2:00 - Pediatric Rounds; Robert Ulstrom; Stations I and J.

Veterans Administration Hospital

- 10:30 - 11:20 Medicine Grand Rounds; Conference Room, Bldg. I.
- 1:00 - Pathology Slide Conference; E. T. Bell; Conference Room, Bldg. I.
- 2:00 - Autopsy Conference; E. T. Bell and Donald Gleason; Conference Room, Bldg. I.

Saturday, June 20

Medical School and University Hospitals

- 7:45 - 8:50 Orthopedic X-ray Conference; W. H. Cole and Staff; M-109, U. H.
- 9:00 - 10:00 Infertility Conference; Louis L. Friedman, David I. Seibel, and Obstetrics Staff; Eustis Amphitheater, U. H.
- 9:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; Heart Hospital Amphitheater.
- 9:15 - 10:00 Surgery-Roentgenology Conference; L. G. Rigler, J. Friedman, Owen H. Wangenstein and Staff; Todd Amphitheater, U. H.
- 10:00 - 11:30 Surgery Conference; Todd Amphitheater, U. H.
- 10:00 - 12:50 Obstetrics and Gynecology Grand Rounds; J. L. McKelvey and Staff; Station 44, U. H.

Ancker Hospital

- 8:30 - 9:30 Surgery Conference; Auditorium.

Minneapolis General Hospital

- 8:00 - Urology Staff Conference; T. H. Sweetser; Main Classroom.
- 11:00 - 12:00 Medical - X-ray Conference; O. Lipschultz, Thomas Lowry, and Staff; Main Classroom

Veterans Administration Hospital

- 8:00 - Proctology Rounds; W. C. Bernstein and Staff; Bldg. III.
- 8:30 - 11:15 Hematology Rounds; Drs. Goldish and Bolin, and Howard.
- 11:15 - 12:00 Morphology Dr. Aufderheide; Conference Room.

IV. TABLE OF CONTENTS: VOLUME XXIV. 1952-53

<u>Bulle-</u> <u>tin</u> <u>Number</u>	<u>Date</u>	<u>Title</u>	<u>Author</u>	<u>Pages</u>
19	2-27-53	ACTH and Cortisone in Allergy	J. S. Blumenthal	395-404
14	1-23-53	Adenomas of the Large Intestine	Walter A. Fansler	296-300
19	2-27-53	Allergy, ACTH and Cortisone in (See ACTH)		
22	3-20-53	Anesthesia, Hypotensive	Frederick H. Van Bergen Joseph J. Buckley Allen B. Dobkin William T. Peyton Lyle A. French Ian A. Brown	452-459
20	3- 6-53	Aortography, Translumbar (See Translumbar)		
8	11-21-52	Arteries, Carotid, Spontaneous Thrombosis of (See Thrombosis)		
13	1-16-53	Audiology	Frank M. Lassman	281-287
6	11- 7-52	Bacterial Endocarditis, Coronary Embolization in (See Coronary Embolization)		
29	5-22-53	Bowel, Small, Roentgen Studies of the (See Roentgen)		
4	10-24-52	Carcinoma <u>In Situ</u> of the Cervix: A General Consideration	John L. McKelvey	101-105
8	11-21-52	Carotid Arteries (See Thrombosis)		
30	5-29-53	Causes, Correlates, and Chance	Alan E. Treloar	611-615
23	3-27-53	Cervical Spine in Relation to Age, Degenerative Changes of the (See Degenerative)		
4	10-24-52	Cervix, Carcinoma <u>In Situ</u> of the (See Carcinoma)		

<u>Bulletin Number</u>	<u>Date</u>	<u>Title</u>	<u>Author</u>	<u>Pages</u>
3	10-17-52	Congenital Heart Disease (See Heart Disease)		
6	11- 7-52	Coronary Embolization in Bacterial Endocarditis	Joel G. Brunson	130-139
30	5-29-53	Correlates, Causes and (See Causes)		
19	2-27-53	Cortisone and ACTH in Allergy (See ACTH)		
25	4-17-53	Culdoscopy	David I. Seibel	503-507
10	12-12-52	Cultures, Tissue, in Medicine (See Tissue)		
23	3-27-53	Degenerative Changes of the Cervical Spine in Relation to Age	Frederic J. Kottke Russell S. Blanchard	470-479
28	5-15-53	Dermatomyositis	Sheldon L. Mandel	570-585
24	4-10-53	Detachment, Retinal (See Retinal)		
18	2-20-53	Diet and the Incidence of Heart Disease	Ancel Keys	376-388
3	10-17-52	Disease, Congenital Heart (See Heart Disease)		
2	10-10-52	Disease, Glycogen Storage (See Glycogen)		
21	3-13-53	Disease, Hodgkin's, Irradiation Therapy in (See Irradiation)		
32	6-12-53	Disease, Staphylococcal, Management of (See Staphylococcal)		
6	11- 7-52	Embolization, Coronary (See Coronary Emboliza- tion)		
6	11- 7-52	Endocarditis, Bacterial, Coronary Embolization in (See Coronary Embolization)		
2	10-10-52	Galactosemia (See Glycogen Storage Disease)		

<u>Bulle-</u> <u>tin</u> <u>Number</u>	<u>Date</u>	<u>Title</u>	<u>Author</u>	<u>Pages</u>
12	1- 9-53	Gastric Resection (See Tubular)		
2	10-10-52	Glycogen Storage Disease and Galactosemia	Robert A. Ulstrom Mildred R. Ziegler Doris Doeden Irvine McQuarrie	54-66
3	10-17-52	Heart Disease, Congenital, The Surgical Treatment of	C. Walton Lillehei Ivan D. Baronofsky Richard L. Varco	75-93
18	2-20-53	Heart Disease, Diet and the Incidence of (See Diet)		
21	3-13-53	Hodgkin's Disease, Irradiation Therapy in (See Irradiation)		
1	10- 3-52	Hospitals Report 1951-52	R. M. Amberg	1-32
22	3-20-53	Hypotensive Anesthesia (See Anesthesia)		
14	1-23-53	Intestine, Adenomas of the Large (See Adenomas)		
21	3-13-53	Irradiation Therapy in Hodgkin's Disease	C. M. Nice K. Wilhelm Stenstrom	430-442
9	12- 5-52	Masked Schizophrenia (See Schizophrenia)		
5	10-31-52	Medical Practice in the State, The Medical School in Relation to	Charles G. Sheppard	115-121
5	10-31-52	Medical School in Relation to Medical Practice in the State, the (See Medical Practice)		
15	1-30-53	Mitral Stenosis (See Valvotomy)		
17	2-13-53	Neurosurgical Procedures for the Relief of Pain	Carrel M. Caudill William T. Peyton Lyle A. French	355-366
31	6- 5-53	Nursing Needs, How the University of Minnesota School of Nursing Meets	Katharine J. Densford	625-636

<u>Bulletin Number</u>	<u>Date</u>	<u>Title</u>	<u>Author</u>	<u>Pages</u>
11	12-19-52	Obstruction, Strangulation, Roentgen Observations in	Harry Z. Mellins Leo G. Rigler	241-249
17	2-13-53	Pain, Neurosurgical Procedures for the Relief of (See Neurosurgical)		
16	2-6-53	Pathogenesis of Rheumatic Fever, the (See Rheumatic Fever)		
26	4-24-53	Pneumothorax, Simple Spontaneous	J. Arthur Myers	524-538
12	1-9-53	Resection, Gastric (See Tubular)		
24	4-10-53	Retinal Detachment	Melvin J. Kirkeeng	488-494
16	2-6-53	Rheumatic Fever, the Pathogenesis of	Lewis Thomas Floyd W. Denny, Jr. Robert A. Good Richard T. Smith	341-348
11	12-19-52	Roentgen Observations in Strangulation Obstruction (See Obstruction)		
29	5-22-53	Roentgen Studies of the Small Bowel	Jack Friedman	593-602
25	4-17-53	Roundsmanship	Henry Jacob Bulfinch, '56 (Reprinted from Harvard Medical Alumni Bulletin, January, 1953, Page 6, with kind permission of Dr. J. Engelbert Dunphy, Editor)	510-515
9	12-5-52	Schizophrenia, Masked	Frank Kiesler	211-217
27	5-1-53	Social Service Reports:		
		A. The University Hospitals Use of Nursing Homes	Annie Laurie Baker	548-554
		B. Nursing Homes and Related Facilities in Minnesota	Helen L. Knudsen	555-559

<u>Bulle-</u> <u>tin</u>	<u>Date</u>	<u>Title</u>	<u>Author</u>	<u>Pages</u>
23	3-27-53	Spine, Cervical, Degen- erative Changes of the (See Degenerative)		
26	4-24-53	Spontaneous Pneumothorax, Simple (See Pneumothorax)		
32	6-12-53	Staphylococcal Disease, Management of	Robert I. Wise Wesley W. Spink	645-658
15	1-30-53	Stenosis, Mitral (See Valvotomy)		
11	12-19-52	Strangulation Obstruc- tion, Roentgen Observa- tions in (See Obstruction)		
3	10-17-52	Surgical Treatment of Congenital Heart Disease (See Heart Disease)		
8	11-21-52	Thrombosis, Spontaneous, of the Carotid Arteries	Sidney K. Shapiro William T. Peyton	188-203
10	12-12-52	Tissue Cultures in Medicine, Current Appli- cation of	William F. Scherer	225-233
20	3- 6-53	Translumbar Aortography, An Evaluation of	C. D. Creevy Ronald W. Krumbach William E. Price	413-420
12	1- 9-53	Tubular Gastric Resec- tion: A Preliminary Evaluation	Lloyd D. MacLean	255-273
7	11-14-52	Urobilin Problem, Recent Studies of the	Paul T. Lowry N. R. Ziegler C. J. Watson	166-180
15	1-30-53	Valvotomy in Mitral Stenosis	A. M. Richards Ivan D. Baronofsky Craig Borden	310-333

V. CUMULATIVE INDEX: 1948-1953

A

- ACTH and Cortisone, Effects of (See Shwartzman Phenomenon)
- ACTH and Cortisone in Allergy (J. S. Blumenthal) XXIV: 395-404; Feb. 27 '53
- ACTH and Cortisone in Eye Disease (Burton G. Olson) XXII: 398-412; April 6 '51
- ACTH and Cortisone in Experimental and Human Brucellosis (See Brucellosis)
- ACTH in Spontaneous Hypoglycemia, The Metabolic and Clinical Effects of (See Pituitary)
- Adenomas in the Rectum and Rectosigmoid, The Significance and Treatment of (H. W. Christianson and Robert J. Tenner) XXI: 75-78; Nov. 4 '49
- Adenomas of the Large Intestine (Walter A. Fansler) XXIV: 296-300; Jan. 23 '53
- Adrenal Function in Surgical Patients (Bernard Zimmermann) XXI: 439-448; May 12 '50
- Alcoholism, Antabuse in the Treatment of (See Antabuse)
- Allergy, ACTH and Cortisone in (See ACTH)
- Amino Acids, Chromatographic Studies of Urinary (Elizabeth G. Frame and Verna L. Rausch) XXIII: 532-543; May 23-52
- Amputee, Rehabilitation of the (See Rehabilitation)
- Amyloidosis (Robert W. Goltz) XXII: 277-285; Feb. 9 '51
- Anemia, Megaloblastic in Infants, Experimental Production of Megaloblastic Anemia in Relation to (Charles D. May, Edward N. Nelson, Robert J. Salmon, Charles U. Lowe, Robert I. Lienke, R. Dorothy Sundberg) XXI: 208-222; Jan. 27 '50
- Anesthesia, Hypotensive (Frederick H. Van Bergen, Joseph J. Buckley, Allen B. Dobkin, William T. Peyton, Lyle A. French, Ian A. Brown) XXIV: 452-459; March 20 '53
- Anesthesia, Paracervical Block (See Obstetrics)
- Aneurysms, Intracranial, and Subarachnoid Hemorrhages (Lyle A. French and Paul S. Blake) XXI: 279-293; Feb. 24 '50
- Angiography, Cerebral (Lyle A. French and Paul S. Blake) XX: 360-370; Feb. 25 '49
- Antabuse in the Treatment of Alcoholism (Jack V. Wallinga) XXII: 118-124; Nov. 24 '50
- Antibiotic Therapy, Advances in (Ellard M. Yow and Wesley W. Spink) XX: 218-248; Jan. 7 '49
- Aortography, Translumbar (See Translumbar)
- Arteries, Carotid, Spontaneous Thrombosis of (See Thrombosis)
- Artificial Kidney, Clinical Uses of the (See Kidney)
- Ascorbic Acid, Metabolic Functions of (Charles D. May, Robert J. Salmon, Charles T. Stewart, Agnes E. Hamilton, Janie F. Figen) XXIII: 29-49; Oct. 19 '51
- Aspiration Biopsy of Bone Marrow (See Bone Marrow)
- Asthma, Cortisone in Allergic (See Cortisone)
- Audiology (Frank M. Lassman) XXIV: 281-287; Jan. 16 '53

B

- Bacterial Endocarditis, Coronary Embolization in (See Coronary Embolization)

Bed-Fast Patient, Deterioration of the
(See Patient)

Bell's Palsy, The Nature of, Medical
Progress Through Research (Jerome A.
Hilger and Owen H. Wangensteen) XXI:
63-67; Oct. 28 '49

Bilateral Carcinoma of the Breast, Non-
Simultaneous (See Carcinoma)

Bilirubin, Serum (Leslie Zieve, Earl
Hill, Mark C. L. Hanson, A. B. Falcone,
C. J. Watson) XXII: 232-253; Jan. 26
'51

Biochemical, Effects of Ionizing Radia-
tions, Some (See Ionizing)

Blood Clotting, Recent Advances (R.
Edward Bell) XX: 589-611; May 27 '49

Bone, Pneumatization of the Temporal
(Lawrence R. Boies and L. Ian Younger)
XXIII: 188-194; Dec. 21 '51

Bone Marrow, Aspiration Biopsy of (R.
Dorothy Sundberg) XXI: 471-505; May 26
'50

Bowel, Small, Roentgen Studies of the
(See Roentgen)

Breast, Carcinoma of the (See Carcinoma)

Breast, Carcinoma of the; An Analysis of
626 Cases Referred for X-ray Therapy
(Harvey W. Stone and Halvor Vermund)
XX: 376-397; March 4 '49

Breast, Estrogen Therapy of Advanced
Cancer of the Female (Robert A. Huseby
and Stuart W. Arhelger) XX: 276-291;
Jan. 21 '49

Brucellosis, Cortisone and Adrenocorti-
cotropic Hormone (ACTH) in Experi-
mental and Human (Robert Abernathy,
Wesley W. Spink, Wendell H. Hall)
XXIII: 259-288; Feb. 1 '52

Bulbar Poliomyelitis (See Poliomyelitis)

Bulbar Poliomyelitis, Persistent Sequel-
ae of (See Poliomyelitis)

C

Cancer, Gastric (Edward E. Mason,
William D. Kelly, T. H. Crawford Bar-
clay) XXII: 344-351; March 2 '51

Cancer, Intra-Oral, How People Feel
About Treatment for, and How They Are
Enabled to Live (Frances D. Boone)
XXII: 496-512; May 18 '51

Cancer, Pulmonary, A Biography of
(Bernard J. O'Loughlin and Richard C.
Tucker) XXII: 537-549; June 1 '51

Cancer of the Female Breast, Estrogen
Therapy of Advanced (See Breast)

Cancers of the Head and Neck, Neck Dis-
section in (T. H. Crawford Barclay,
Leonard F. Peltier, Arnold J. Kremen)
XXII: 36-41; Oct. 20 '50

Carcinoma In Situ of the Cervix: A Gen-
eral Consideration (John L. McKelvey)
XXIV: 101-105; Oct. 24 '52

Carcinoma of the Breast: An Analysis of
626 Cases Referred for X-ray Therapy
(See Breast)

Carcinoma of the Breast, Non-Simultane-
ous Bilateral (T. Brannon Hubbard, Jr.)
XXIII: 201-212; Jan. 11 '52

Carcinoma of the Cervix, Results of Ex-
perimental Therapy (John L. McKelvey,
Karl W. Stenstrom and John S. Gillam)
XXI: 386-395; April 21 '50

Carcinoma of the Stomach, Superficial
(Robert Hebbel) XXII: 59-67; Nov. 3
'50

Carcinoma of the Vagina, Primary (Irwin
H. Kaiser) XXIII: 494-509; May 9 '52

Carcinoma of the Vulva, The Treatment of
(John L. McKelvey) XXIII: 76-84; Nov.
2 '51

Cardiac Cirrhosis (See Cirrhosis)

Cardiac Risk (See Electroconvulsive
Therapy)

- Cardiovascular Degeneration at the Laboratory of Physiological Hygiene, Some Preliminary Findings from the Research Program on (Ancel Keys) XX: 403-410; March 11 '49
- Cardiovascular Diseases, Rheumatic Type, Experimental Studies in (Tom R. Hamilton and Jerome T. Syverton) XXI: 173-185; Jan. 13 '50
- Carotid Arteries (See Thrombosis)
- Catheterization of the Heart (See Heart)
- Causes, Correlates, and Chance (Alan E. Treloar) XXIV: 611-615; May 29 '53
- Cerebral Angiography (See Angiography)
- Cervical Spine in Relation to Age, Degenerative Changes of the (See Degenerative)
- Cervix, Carcinoma In Situ of the (See Carcinoma)
- Cervix, Carcinoma of (See Carcinoma)
- Chromatographic Studies of Urinary Amino Acids (See Amino Acids)
- Circulation, Vertebral Venous (Harry Z. Mellins) XXII: 213-224; Jan. 19 '51
- Cirrhosis, Cardiac (J. S. McCartney) XX: 93-96; Oct. 15 '48
- Colitis, The Liver in Ulcerative (Frederick W. Hoffbauer, Clarence Dennis, Karl Karlson) XXIII: 129-140; Nov. 23 '51
- Colon, Sigmoid (See Rectum)
- Congenital Heart Disease (See Heart Disease)
- Congenital Heart Disease, Catheterization in (See Heart Disease)
- Congenital Heart Disease, An Electroky-mographic Study of (See Heart Disease)
- Convulsive Disorders in Adults (Robert L. Meller and Joseph A. Resch) XX: 78-87; Oct. 8 '48
- Coronary Embolization in Bacterial Endocarditis (Joel G. Brunson) XXIV: 130-139; Nov. 7 '52
- Coronary Sclerosis, A Study of the Pathogenesis of (Paul H. Lober) XXIII: 92-109; Nov. 9 '51
- Correlates, Causes and Chance (See Causes)
- Cortisone and ACTH in Allergy (See ACTH)
- Cortisone and ACTH in Experimental and Human Brucellosis (See Brucellosis)
- Cortisone and ACTH in Eye Disease (See ACTH)
- Cortisone and ACTH (See Shwartzman Phenomenon)
- Cortisone in Allergic Asthma (J. S. Blumenthal) XXII: 378-391; March 16 '51
- Criminal Interrogation, Narco-Analysis for (See Narco-Analysis)
- Culdoscopy (David I. Seibel) XXIV: 503-507; April 17 '53
- Cultures, Tissue, in Medicine (See Tissue)
- D
- Degenerative Changes of the Cervical Spine in Relation to Age (Frederic J. Kottke and Russell S. Blanchard) XXIV: 470-479; March 27 '53
- Dermatomyositis (Sheldon L. Mandel) XXIV: 570-585; May 15 '53
- Detachment, Retinal (See Retinal)
- Deterioration of the Bed-Fast Patient (See Patient)
- Diabetes, Human and Experimental, Pathologic Changes in: A Morphological Comparison of the, Within the Islands of Langerhans (Carl A. Peterson) XXI: 100-112; Dec. 2 '49

Diabetic Retinopathy (Bruce L. Kantar)
XXI: 352-360; Mar. 31 '50

Diagnosis, Early, of Tumors of the
Stomach from the Roentgen Standpoint
(See Stomach)

Diagnosis of Jaundice, Evaluation of
Laboratory Tests in the Differential
(See Jaundice)

Diet and the Incidence of Heart Disease
(Ancel Keys) XXIV: 376-388; Feb. 20
'53

Disease, Congenital Heart (See Heart
Disease)

Disease, Glycogen Storage (See Glycogen)

Disease, Hodgkin's, Irradiation Therapy
in (See Irradiation)

Disease, Staphylococcal, Management of
(See Staphylococcal)

E

Electrocardiographic Abnormalities
Occurring During Endotracheal Intuba-
tion (See Intubation)

Electrocardiography, Criteria of Normal-
ity in Clinical (Ernst Simonson) XXIII:
371-385; Mar. 14 '52

Electroconvulsive Therapy: The Cardiac
Risk (Clarence J. Rowe and Burtrum C.
Schiele) XXI: 1-7; Sept. 30 '49

Electrokymographic Study of Pulmonary
Pulsations (See Heart)

Electrophrenic Respiration (See Respira-
tion)

Embolization, Coronary (See Coronary
Embolization)

Endocarditis, Bacterial, Coronary Embo-
lization in (See Coronary Embolization)

Endotracheal Intubation (See Intubation)

Epiphyseal Growth, Control of Human
(Douglas T. Lindsay) XX: 450-469;
April 8 '49

Erythrocyte Survival Under Normal and
Pathologic Conditions (Paul S. Hagen)
XXIII: 552-567; June 6 '52

Essential Hypertension (See Hexamethoni-
um)

Estrogen Therapy of Advanced Cancer of
the Female Breast (See Breast)

Eye Disease, The Evaluation of ACTH and
Cortisone in (See ACTH)

F

Factors That Influence Phagocytosis In
Vitro (See Phagocytosis)

Femur, The Treatment of Fractures of the
Shaft of the (See Intramedullary Nail-
ing)

Fractures of the Shaft of the Femur, The
Treatment of (See Intramedullary Nail-
ing)

G

Galactosemia (See Glycogen Storage
Disease)

Gastric Cancer (See Cancer)

Gastric Resection (See Tubular)

Gastric Ulcer (See Ulcer)

Glycogen Storage Disease and Galacto-
semia (Robert A. Ulstrom, Mildred R.
Ziegler, Doris Doeden, Irvine McQuar-
rie) XXIV: 54-66; Oct. 10 '52

Growth, Control of Human Epiphyseal
(See Epiphyseal)

H

Haptene, Experience with Rh (See Rh
Haptene)

- Hay Fever in the Adult, Treatment of (J. S. Blumenthal) XX: 416-427; March 18 '49
- Head and Neck, Cancers of the (See Cancers)
- Head Pain (Lawrence R. Boies and Jerome A. Hilger) XXII: 149-156; Dec. 15 '50
- Heart Catheterization in Congenital Heart Disease, The Value and Limitations of (John W. LaBree, Forrest H. Adams, Joseph Jorgens) XXI: 191-202; Jan. 20 '50
- Heart Disease, Congenital, An Electrokymographic Study of the Pulmonary Pulsations in (Joseph Jorgens, John W. LaBree, Forrest H. Adams, Lloyd G. Veasy) XXI: 243-253; Feb. 10 '50
- Heart Disease, Congenital, The Surgical Treatment of (C. Walton Lillehei, Ivan D. Baronofsky, Richard L. Varco) XXIV: 75-93; Oct. 17 '52
- Heart Disease, Diet and the Incidence of (See Diet)
- Hematomas, Subdural, in Infants (Martin E. Feferman, Lyle A. French, William T. Peyton, William R. Heilig, Wentworth Quast) XXIII: 353-363; Mar. 7 '52
- Hemolysis During Trans-Urethral Resection: Its Influence on Operative Mortality (C. D. Creevy and Robert N. Evert) XXI: 229-236; Feb. 3 '50
- Hemorrhage, Subarachnoid, and Intracranial Aneurysm (Lyle A. French and Paul S. Blake) XXI: 279-293; Feb. 24 '50
- Hereditary Periodic Paralysis (See Periodic Paralysis)
- Hexamethonium Compounds in the Treatment of Essential Hypertension (Carleton B. Chapman) XXIII: 392-402; Mar. 21 '52
- Hirschsprung's Disease (See Megacolon)
- Hodgkin's Disease, Irradiation Therapy in (See Irradiation)
- Hospitals Report 1947-1948 (R. M. Amberg) XX: 5-72; Oct. 1 '48
- Hospitals Report 1948-1949 (R. M. Amberg) XXI: 13-28; Oct. 7 '49
- Hospitals Report 1949-1950 (R. M. Amberg) XXII: 15-29; Oct. 13 '50
- Hospitals Report 1950-1951 (R. M. Amberg) XXIII: 1-18; Oct. 5 '51
- Hospitals Report 1951-1952 (R. M. Amberg) XXIV: 1-32; Oct. 3 '52
- Hyaluronidase, Inhibition by Serum in Skin Diseases (Melvin L. Grais and David Glick) XXI: 259-272; Feb. 17 '50
- Hydrocephalus (Gerald L. Haines, Carrel M. Caudill, William T. Peyton) XXII: 319-336; Feb. 23 '51
- Hypercapnia, The Clinical Use of the Mass Spectrometer in the Study of (Allen B. Dobkin and Frederick H. Van Bergen) XXIII: 410-421; Mar. 28 '52
- Hypertension, Hexamethonium Compounds in the Treatment of Essential (See Hexamethonium)
- Hyperglycemia, The Metabolic and Clinical Effects of ACTH (See Pituitary)
- Hypotensive Anesthesia (See Anesthesia)
- Hypothalamus in Poliomyelitis (See Poliomyelitis)
- I
- Index, Cumulative, 1944-49; XX: 674-682; June 10 '49
- Index, Cumulative, 1945-50; XXI: 561-569; June 9 '50
- Index, Cumulative, 1946-51; XXII: 593-602
- Index, Cumulative, 1947-52; XXIII: 601-610; June 13 '52
- Index, Cumulative, 1948-53; XXIV: 671-681; June 12 '53

Infant Megaloblastic Anemia (See Anemia)

Infant Methemoglobinemia in Minnesota,
Due to Nitrate in Well Water (A. B.
Rosenfield and Roberta Huston) XXI:
315-332; Mar. 10 '50

Infants, Subdural Hematomas in (See
Hematomas)

Infection Following Transurethral Resec-
tion of the Prostate Gland (See
Prostate)

Inferior Vena Cava, Roentgen Aspects of
the (B. J. O'Loughlin) XX: 297-308;
Jan. 28 '49

Intestine, Adenomas of the Large (See
Adenomas)

Intestine, Epithelial Tumors of the
Large (Walter A. Fansler and Howard M.
Frykman) XX: 172-182; Nov. 19 '48

Intestinal Tube of Improved Design,
Clinical Results of the Use of a
Long (John Julian Wild and Jacob
Strickler) XX: 539-568; May 13 '49

Intramedullary Nailing, The Treatment of
Fractures of the Shaft of the Femur by
(Leonard F. Peltier) XXIII: 445-451;
April 18 '52

Intra-Oral Cancer (See Cancer)

Intubation, Endotracheal, Electrocardio-
graphic Abnormalities Occurring During
(Joseph Buckley and Frederick H. Van
Bergen) XXII: 470-474; May 4 '51

Ionizing Radiations, Some Biochemical
Effects of (Samuel Schwartz) XX: 617-
654; June 3 '49

Iron Metabolism in Liver Disease (Robert
B. Howard) XXI: 133-145; Dec. 16 '49

Iron Metabolism in Pregnancy (Roy G.
Holly) XX: 475-500; April 22 '49

Iron Therapy, Intravenous (Roy G. Holly)
XXI: 83-94; Nov. 18 '49

Irradiation Therapy in Hodgkin's Disease
(C. M. Nice and K. Wilhelm Stenstrom)
XXIV: 430-442; Mar. 13 '53

J

Jaundice, Evaluation of Laboratory Tests
in the Differential Diagnosis of
(F. W. Hoffbauer, E. D. Rames, J. K.
Meinert) XX: 154-165; Nov. 12 '48

K

Kidney, Clinical Uses of the Artificial
(F. John Lewis, Milton P. Reiser,
Richard H. Egdahl, Francisco L.
Raffucci, Edmund B. Flink) XXIII: 58-
68; Oct. 26 '51

L

Laboratory Tests in Differential Diag-
nosis of Jaundice, Evaluation of (See
Jaundice)

Legg-Perthes' Disease, A Radiographic
Study of 191 Cases of (David J. Nelson)
XXI: 366-379; Apr. 14 '50

Lesions of the Lung, Coin (See Lung)

Lesions of the Tonsil, Malignant (See
Tonsil)

Liver, in Ulcerative Colitis (See
Colitis)

Liver Disease, Iron Metabolism in (See
Iron)

Lung, Coin Lesions of the (Daniel L.
Fink, Joseph J. Asta) XXIII: 576-586;
June 13 '52

Lymphosarcoma, Treatment of (Charles Nice
and K. Wilhelm Stenstrom) XXII: 420-
428; Apr. 13 '51

M

Malignant Lesions of the Tonsil (See
Tonsil)

Masked Schizophrenia (See Schizophrenia)

Mass Spectrometer, The Clinical Use in the Study of Hypercapnia (See Hypercapnia)

Medical Practice in the State, The Medical School in Relation to (Charles G. Sheppard) XXIV: 115-121; Oct. 31 '52

Medical School in Relation to Medical Practice in the State, The (See Medical Practice)

Megaloblastic Anemia in Infants (See Anemia)

Megacolon, Congenital, The Surgical Treatment of Idiopathic (Hirschsprung's Disease) (David State and William Rogers) XXII: 164-181; Dec. 22 '50

Metabolic Functions of Ascorbic Acid (See Ascorbic Acid)

Metabolic Functions of Vitamin B Complex (See Vitamin B)

Methemoglobinemia in Infants in Minnesota, Due to Nitrate in Well Water (A. B. Rosenfield and Roberta Huston) XXI: 315-332; Mar. 10 '50

Microbiology, Medical (William J. Cromartie) XXII: 520-530; May 25 '51

Mitral Stenosis (See Valvotomy)

Myelography, Experiments with New Contrast Media (Osmond J. Baggenstoss and A. B. Baker) XXI: 511-523; June 2 '50

Myometrial Activity of the Pregnant Human Uterus (Irwin H. Kaiser) XXII: 482-488; May 11 '51

Myxedema, Localized (Harold G. Hurst) XX: 341-354; Feb. 18 '49

N

Nailing, The Treatment of Fractures of the Shaft of the Femur by Intramedullary (See Intramedullary Nailing)

Narco-Analysis of Criminal Interrogation (James H. Matthews) XXI: 422-432; May 5 '50

Neomycin: Clinical Investigations (Burton A. Waisbren and Wesley W. Spink) XXI: 530-551; June 9 '50

Neoplastic Disease, Palliative Radiation Therapy in (K. W. Stenstrom and Jack Friedman) XXI: 300-308; Mar. 3 '50

Neurosurgical Procedures for the Relief of Pain (Carrel M. Caudill, William T. Peyton, Lyle A. French) XXIV: 355-366; Feb. 13 '53

Nitrate in Well Water in Minnesota Causing Infant Methemoglobinemia (See Methemoglobinemia)

Nursing Needs, How the University of Minnesota School of Nursing Meets (Katharine J. Densford) XXIV: 625-636; June 5 '53

O

Obstetrics, Paracervical Block Anesthesia in (Donald W. Freeman) XXII: 48-52; Oct. 27 '50

Obstruction, Strangulation, Roentgen Observations in (Harry Z. Mellins and Leo G. Rigler) XXIV: 241-249; Dec. 19 '52

Ophthalmia, Sympathetic (Ernst S. Palmer-ton) XXIII: 477-486; May 2 '52

Orthosrugery, The Use of Staples in (Edward H. Kelly) XXII: 436-444; Apr. 20 '51

Oxygen Therapy, Problems of (Frederic J. Kottke, William G. Kubicek, Glenn Gullickson, G. Keith Stillwell) XXI: 455-464; May 19 '50

P

Pain, Head (See Head)

Pain, Neurosurgical Procedures for the Relief of (See Neurosurgical)

- Papilledema, Papillitis, Pseudo-Neuritis (Llewellyn E. Christensen) XX: 433-443; Apr. 1 '49
- Paracervical Block Anesthesia (See Obstetrics)
- Paralysis, Hereditary Periodic (See Periodic Paralysis)
- Paralysis, Vocal Cord (See Vocal Cord)
- Parkinsonism, Drug Therapy in (Sidney K. Shapiro) XXII: 74-89; Nov. 10 '50
- Pathogenesis of Coronary Sclerosis, A Study of the (See Coronary Sclerosis)
- Pathogenesis of Rheumatic Fever, The (See Rheumatic Fever)
- Pathologic Changes in Experimental and Human Diabetes (See Diabetes)
- Patient, Deterioration of the Bed-Fast (Frederic J. Kottke) XXIII: 460-469; Apr. 25 '52
- Patients Admitted to Psychiatric Service, University Hospitals, 1938-1944, Follow-Up Study of (See Psychiatric Service)
- Pentothal-Curare Mixture with Endotracheal N₂O and O₂ in Infants (Christine Furman Webster and Frederick H. Van Bergen) XX: 525-533; May 6 '49
- Peptic Ulcer, Treatment of Perforated; Analysis of 50 Operated Cases at University of Minnesota Hospitals (Robert N. Hammerstrom) XXI: 52-57; Oct. 21 '49
- Periodic Paralysis, Hereditary - Metabolic Studies (Irvine McQuarrie, Mildred R. Ziegler) XXIII: 269-305; Feb. 8 '52
- Phagocytosis In Vitro, Factors That Influence (John D. Krafchuk, J. T. Syverton, R. H. Saunders, Jr.) XXIII: 312-329; Feb. 15 '52
- Pituitary Adrenocorticotrophic Hormone (ACTH) in Spontaneous Hypoglycemia, The Metabolic and Clinical Effects of (Irvine McQuarrie, E. G. Bauer, M. R. Ziegler, W. S. Wright) XXI: 34-45; Oct. 14 '49
- Pneumatization of the Temporal Bone (See Bone)
- Pneumonias, Non-Bacterial (Jerome T. Syverton) XX: 254-270; Jan. 14 '49
- Pneumothorax, Simple Spontaneous (J. Arthur Myers) XXIV: 524-538; Apr. 24 '53
- Poliomyelitis Occurring After Antigen Injections (Gaylord W. Anderson and Audrey E. Skaar) XXII: 359-370; Mar. 9 '51
- Poliomyelitis, Persistent Sequellae of Bulbar (Wallace Lueck, John Galligan, Wayne LeBien, and James F. Bosma) XX: 333-335; Feb. 11 '49
- Poliomyelitis, The Hypothalamus: Clinical Studies in Bulbar (Ian A. Brown and A. B. Baker) XXIII: 116-121; Nov. 16 '51
- Porphyria (Paul T. Lowry, Rudi Schmid, Violet E. Hawkinson, Samuel Schwartz, C. J. Watson) XXII: 97-110; Nov. 17 '50
- Pregnancy, Iron Metabolism in (See Iron)
- Prostate Gland, Infection Following Transurethral Resection of the (C. D. Creevy and Michael J. Feeney) XX: 314-327; Feb. 4 '49
- Pruritus Ani (Howard M. Frykman and Walter A. Fansler) XXIII: 167-179; Dec. 14 '51
- Psychiatric Service, Follow-Up Study of Patients Admitted to Psychiatric Service, University Hospitals, 1938-1944 (Donald W. Hastings, Starke R. Hathaway, Dorothy M. Bell) XXIII: 149-159; Dec. 7 '51

Psychological Evaluation of Surgical Patients (Robert A. Schneider, Jerome S. Gray, Charles U. Culmer) XX: 201-211; Dec. 10 '48

Psychological Medicine in a General Medical Setting (Richard M. Magraw) XXI: 339-346; Mar. 17 '50

Psychosomatic Aspects of Pediatrics (Joseph Carpentieri and Reynold A. Jensen) XX: 102-110; Oct. 22 '48

Pulmonary Cancer (See Cancer)

Pulmonic Stenosis, Surgical Treatment of (Richard L. Varco, K. Alvin Merendino, Fletcher A. Miller) XX: 117-133; Oct. 29 '48

R

Radiation Therapy in Neoplastic Diseases (See Neoplastic)

Rectosigmoid, Adenoma of (See Adenoma)

Rectum, Adenoma of (See Adenoma)

Rectum and Sigmoid Colon, Injuries and Perforations of (Earl D. Myers and William C. Bernstein) XXII: 133-141; Dec. 8 '50

Rehabilitation, of the Amputee (Glenn Gullickson, Jr. and Frederic J. Kottke) XX: 574-584; May 20 '49

Rehabilitation, Vocational, of University Hospitals Patients (Annie Laurie Baker) XXIII: 517-519; May 16 '52

Rehabilitation, Vocational, Minnesota Division of Vocational Rehabilitation (Ben R. Brainerd) XXIII: 520-524; May 16 '52

Research Program on Cardiovascular Degeneration at the Laboratory of Physiological Hygiene, Some Preliminary Findings from the (See Cardiovascular)

Resection, Gastric (See Tubular)

Respiration, Electrophrenic (G. Keith Stillwell and Frederic J. Kottke) XXII: 452-462; Apr. 27 '51

Retinal Detachment (Melvin J. Kirkeeng) XXIV: 488-494; Apr. 10 '53

Retinopathy, Diabetic (See Diabetic)

Rheumatic Fever, The Pathogenesis of (Lewis Thomas, Floyd W. Denny, Jr., Robert A. Good, Richard T. Smith) XXIV: 341-348; Feb. 6 '53

Rheumatic Heart Disease (See Cardiovascular Disease)

Rh Haptene, Experiences with (Joseph W. Goldsmith) XX: 188-194; Dec. 3 '48

Roentgen Aspects of the Inferior Vena Cava (See Inferior)

Roentgen Observations in Strangulation Obstruction (See Obstruction)

Roentgen Studies of the Small Bowel (Jack Friedman) XXIV: 593-602; May 22 '53

Roentgenologic Diagnosis of Benign Gastric Ulcer (See Ulcer)

Roundsmanship (Henry Jacob Bulfinch, '56) (Reprinted from Harvard Medical Alumni Bulletin, Jan., 1953, Page 6, with kind permission of Dr. J. Engelbert Dunphy, Editor) XXIV: 510-515; Apr. 17 '53

S

Schizophrenia, Masked (Frank Kiesler) XXIV: 211-217; Dec. 5 '52

Sclerosis, A Study of the Pathogenesis of Coronary (See Coronary Sclerosis)

Sequellae of Bulbar Poliomyelitis, Persistent (See Poliomyelitis)

Shwartzman Phenomenon, and its Alteration by Cortisone and ACTH (Lewis Thomas and Robert A. Good) XXII: 261-269; Feb. 2 '51

- Sigmoid Colon, Injuries and Perforations of (See Rectum)
- Skin Diseases, Inhibition of Hyaluronidase by Serum (See Hyaluronidase)
- Social Service Reports:
Factors in Patient's Adjustment to Rest Home Care (Helen Kretchmer)
- Study of Referrals to Social Service (Rose Baldwin)
- The Family as a Factor in the Epileptic's Social Adjustment (Jean Cummins) XX: 506-519; Apr. 29 '49
- Social Service Reports:
A Study of Admissions on Station 30 and 31 (Marion Ekholm)
- A Study of Selected Social and Emotional Factors Occurring Among Individuals Examined in a Cancer Detection Center (Helen Graham, Eldred Gorder, Audrey Neime, Raymond Newman, Thelma Levine, Alice Quist)
- Interruptions of Medical Care (Annie L. Baker) XXI: 402-414; Apr. 28 '50
- Social Service Reports:
A. The University Hospitals Use of Nursing Homes (Annie Laurie Baker)
- B. Nursing Homes and Related Facilities in Minnesota (Helen L. Knudsen) XXIV: 548-559; May 1 '53
- Sodium Chloride in Surgical Patients, Compartmental Distribution of, Pre- and Postoperatively (Irving M. Ariel and Arnold J. Kremen) XXI: 151-166; Jan. 5 '50
- Spectrometer, Mass, The Clinical Use in the Study of Hypercapnia (See Hypercapnia)
- Speech, Disorders of (Spencer F. Brown, Ellsworth Stenswick, Reynold A. Jensen) ZXII: 1-8; Oct. 6 '50
- Spine, Cervical, Degenerative Changes of the (See Degenerative)
- Spontaneous Pneumothorax, Simple (See Pneumothorax)
- Staphylococcal Disease, Management of Robert I. Wise and Wesley W. Spink) XXIV: 645-658; June 12 '53
- Staples, Use in Orthosurgery (See Orthosurgery)
- Stenosis, Mitral (See Valvotomy)
- Stomach, Carcinoma of the (See Carcinoma)
- Stomach from the Roentgen Standpoint, Early Diagnosis of Tumors of the (F. Ruzicka) XX: 660-669; June 10 '49
- Strangulation Obstruction, Roentgen Observations in (See Obstruction)
- Streptococcosis, The Biology of Group A (Dennis W. Watson and William J. Cromartie) XXII: 188-204; Jan. 12 '51
- Subarachnoid Hemorrhages (See Hemorrhages)
- Subdural Hematomas in Infants (See Hematomas)
- Surgical Treatment of Congenital Heart Disease (See Heart Disease)
- Survival, Erythrocyte, Under Normal and Pathologic Conditions (See Erythrocyte)
- Sympathetic Ophthalmia (See Ophthalmia)
- T
- Temporal Bone, Pneumatization of the (See Bone)
- Testicular Tumors (See Tumors)
- Tetanus, The Treatment of (Jolyn S. Tucker and Gene M. Lasater) XXI: 118-127; Dec. 9 '49
- Therapy, Drug, in Parkinsonism (See Parkinsonism)
- Thrombosis, Spontaneous, of the Carotid Arteries (Sidney K. Shapiro and William T. Peyton) XXIV: 188-203; Nov. 21 '52

Tissue Cultures in Medicine, Current Application of (William F. Scherer) XXIV: 225-233; Dec. 12 '52

Tonsil, Malignant Lesions of the (Dale B. Parshall and K. W. Stenstrom) XXIII: 429-438; Apr. 4 '52

Translumbar Aortography, An Evaluation of (C. D. Creevy, Ronald W. Krumbach, William E. Price) XXIV: 413-420; Mar. 6 '53

Transurethral Resection, Hemolysis During: Its Influence on Operative Mortality (See Hemolysis)

Transurethral Resection of the Prostate Gland, Infection Following (See Prostate)

Tuberculosis, Antibodies in (Wendell H. Hall) XXII: 557-567; June 8 '51

Tubular Gastric Resection: A Preliminary Evaluation (Lloyd D. MacLean) XXIV: 255-273; Jan. 9 '53

Tumor, Wilms' (See Wilms')

Tumors, Testicular (Ronald W. Krumbach, C. D. Creevy) XXIII: 335-345; Feb. 29 '52

Tumors of the Stomach from the Roentgen Standpoint, Early Diagnosis of (See Stomach)

Tumors of the Large Intestine, Epithelial (See Intestine)

U

Ulcer, Perforated Peptic, Treatment of: Analysis of 50 Operated Cases at University of Minnesota Hospitals (Robert N. Hammerstrom) XXI: 52-57; Oct. 2 '49

Ulcer, Roentgenologic Diagnosis of Benign Gastric (C. J. Corrigan and Harold O. Peterson) XXIII: 243-250; Jan. 25 '52

Ulcerative Colitis, The Liver in (See Colitis)

Uterus, Myometrial Activity of the Pregnant Human (See Myometrial)

Urinary Amino Acids, Chromatographic Studies of (See Amino Acids)

Urobilin Problem, Recent Studies of the (Paul T. Lowry, N. R. Ziegler, C. J. Watson) XXIV: 166-180; Nov. 14 '52

V

Vagina, Primary Carcinoma of the (See Carcinoma)

Valvotomy in Mitral Stenosis (A. M. Richards, Ivan D. Baronofsky, Craig Borden) XXIV: 310-333; Jan. 30 '53

Venous Circulation, Vertebral (See Circulation)

Vertebral Venous Circulation (See Circulation)

Vitamin B Complex, Metabolic Functions of the (Herman C. Lichstein) XXIII: 221-235; Jan. 18 '52

Vocal Cord Paralysis (Harold S. Ulvestad and L. R. Boies) XX: 140-147; Nov. 5 '48

Vocational Rehabilitation (See Rehabilitation)

Vulva, The Treatment of Carcinoma of the (See Carcinoma)

W

Wilms' Tumor (C. D. Creevy and Milton P. Reiser) XXII: 292-312; Feb. 16 '51

X

X-ray Therapy, Carcinoma of the Breast: An Analysis of 626 Cases Referred for (See Breast)