

Bulletin of the
**University of Minnesota Hospitals
and
Minnesota Medical Foundation**



**Palliative Radiation Therapy
In Neoplastic Disease**

BULLETIN OF THE
UNIVERSITY OF MINNESOTA HOSPITALS
and
MINNESOTA MEDICAL FOUNDATION

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I. PALLIATIVE RADIATION THERAPY
IN NEOPLASTIC DISEASE

K. W. Stenstrom
Jack Friedman

The time honored method of evaluation of the results of roentgen therapy in the treatment of neoplastic disease is in a review of all cases of the type of neoplastic disease under investigation, previously treated and in which follow-up study has been accomplished and in which the five year or better cure rate or survival rate has been established by a critical statistical study of the data. Many such reports have been published by Dr. Stenstrom and his co-workers from our department in the past and have been presented at staff meetings previously.

The criteria for correct and honest evaluation of these statistical results of survival rates necessitates the inclusion of all cases of the disease under evaluation in the study referred for treatment and does not allow for the exclusion of any cases for lack of follow-up or claim of inadequate therapy. A patient from whom reply is not obtained on persistent follow-up correspondence must be considered as dead and will thus lower the percentage survival figures. For further accuracy in evaluating this group, histological proof of the diagnosis is necessary.

Such a rigid discipline in evaluating the results of therapy in any disease, no matter what the method of therapy, may provide a critical appraisal of the efficacy of the therapeutic method and provides a means of comparison of the relative merits between various types of treatment and one can compare his results with those of other workers in the field. Thus, if he finds his results inferior he is inspired to improve them and if he finds them superior he will publish the figures with pride to get others to emulate him. Such publications with pride are the source of "jokers in the deck" and one must study the data of these results critically

before complete acceptance of the conclusions.

Statistical results can be colored by selection of cases for therapy with exclusion of the most far advanced cases, by exclusion of those cases in which follow-up study could not be completed, and by reporting of such cases as adenomas and what is commonly accepted as benign polyps, as adenocarcinoma Grade I.

An excellent example of a proper procedure of therapeutic evaluation is in the criteria for the reporting and staging of cases of carcinoma of the cervix as established by the League of Nations Committee. Institutions reporting their results under these criteria will find a suitable means of comparing the results of their methods with those of other institutions.

Any physician engaged in effort in a large tumor clinic or radiation therapy department is impressed immediately with the number of patients presenting themselves for treatment in a condition classified as hopeless or nearly so or who may rapidly progress to such a state, and in which any treatment administered must be considered merely palliative. We have summarized the last one-hundred cases of 1949 referred to the Radiation Therapy department for deep x-ray therapy and have classified them broadly as to the type of lesion treated and have subdivided those cases of malignant lesions into two main groups:

1. Those in which curative therapy was thought possible.
2. Those in which palliative effect alone was expected (Fig. 1).

Thus, we can see the greatest part of our effort in the Radiation Therapy Department is in the treatment of patients with malignancy in which at the onset palliative results can at best be expected. In the past, little has been written on this important phase of our work. Certainly these less fortunate individuals are included in our reportable results but in the greater part fall in that group of non-survivals.

Figure 1CLASSIFICATION OF LAST 100 CASES IN 1949
REFERRED FOR DEEP ROENTGEN THERAPYBENIGN LESIONS

Peritendinitis Calcarea	7
Ankylosing Spondylitis	2
Retinitis Proliferans	1
Paget's Disease of Bone	1
Osteoarthritis	8
Tuberculosis Adenitis	2
Acute Parotitis	1
Tenosynovitis	1
Lymphoid Hyperplasia of Pharynx	4
Acromegaly	1
Pituitary Tumor - Chromophobe Adenoma	1
Total	<u>29</u>

MALIGNANT LESIONSCurative Attempt

Carcinoma of Cervix	11
Adenocarcinoma of Ovary - Post-operative	1
Adenocarcinoma of Endometrium	2
Carcinoma of Vagina	1
Carcinoma of Alveolar Ridge	1
Carcinoma of Sinuses and Nasopharynx	3
Carcinoma of Larynx - Extrinsic	1
Postoperative Carcinoma of Breast	5
Reticulum Cell Sarcoma, 3rd Lumbar Vertebra	1
Wilm's Tumor of Kidney	1
Total	<u>27</u>

MALIGNANT LESIONSPalliative Attempt

Squamous Cell Carcinoma of Cervix - Recurrent	2
Carcinoma of Breast, Metastatic and Recurrent	10
Pontine Tumor, Unclassified	1
Tumor III Ventricle, Unclassified	1
Carcinoma of Submaxillary Gland, Recurrent	1
Carcinoma of Antrum with Extension to Orbit	1
Sarcoma of Mastoid	1
Transitional Cell Carcinoma of Nasopharynx with Metastases	1
Squamous Cell Carcinoma, Left Alveolar Ridge, Re- current	1
Squamous Cell Carcinoma of Lower Lip and Mandible	1
Carcinoma of Thyroid with Metastases	1

Figure 1 (Cont.)

CLASSIFICATION OF LAST 100 CASES IN 1949
REFERRED FOR DEEP ROENTGEN THERAPYMALIGNANT LESIONSPalliative Attempt (Cont.)

Carcinoma of Larynx - Extrinsic and with Metastases	1
Carcinoma of Lung - Inoperable	1
Metastatic Carcinoma, Primary Unknown	3
Osteogenic Sarcoma? Mandible	1
Sarcoma - Undifferentiated - Soft Tissue	1
Hypernephroma with Metastases	1
Carcinoma of Rectum - Recurrent	2
- - - - -	
Hodgkin's Disease	4
Lymphosarcoma	4
Lymphoblastoma - Unclassified	3
Chronic Lymphatic Leukemia	2
Total	<u>44</u>

An explanation for the paucity of reports in this important field is obvious. It is difficult to marshall data and facts to present in support of one's beliefs. Certainly survival rates give no indication of the true value of the effort.

By what other criteria can we judge our efforts?

By reduction in size of the tumor:
That result alone would be to no avail. The immediate satisfaction to the physician and patient to see the tumor reduced in size would give way to despair as the tumor would again expand. Such expression of results as centimeters decrease in size could be colored easily by the use of an "elastic rule". Decrease in size of the tumor alone is the basis by which the cancer paste quacks can mulct the public.

By increase in the length of life of the patient: To questionably extend the life of a patient with terminal malignant disease confined hopelessly to bed, with marked pain and suffering and a burden to himself and family is certainly not the aid of our effort.

It is in the relief of pain and bodi-

ly distress, the ability of the patient to remain ambulatory and to care for himself, and the continuation of a relatively comfortable, pleasant existence that we will obtain the most satisfactory result we can hope for our labor.

In March, 1947, Professor D. W. Smithers of the Royal Cancer Hospital of London in a Presidential address to the British Institute of Radiology urged the adoption of the term "Symptom-Free Rates". Recently Dr. George Pack at a tumor conference at this hospital also suggested the extended use of this term and the evaluation of therapeutic results in the same light. Certainly Dr. Wangenstein and the members of his department have brought the same message to us in evaluating the results of gastric resection in carcinoma of the stomach in those patients previously considered, and still considered by others as inoperable. The surgeons believe they add fifteen months of relatively painless existence to those patients in which the resection can be accomplished, and five-year survival rates alone as a method of evaluating the results of treatment in this group would give a hopeless and a superficial view of the results accomplished.

Patients are referred to us for roent-

gen therapy of malignant disease from most all the services in the hospital. It is rather infrequent that the request for therapy is rejected. These rejected cases, it is understood, fall into that large group referred for palliative effect. The thought promoting the referral is usually as follows: "The case is obviously hopeless; nothing can be done (meaning the surgeon cannot and has refused to excise the lesion) so let us give him a few x-ray treatments". Another parallel line of thought is more frequently seen in small general hospitals when the surgeon does not feel confident of the efficacy of his operation and will advise the radiologist, usually in the corridor, on the curb or privately and confidentially in his office, that he removed a uterus with a tumor but he may not have excised all the tumor in the organ, and therefore, the patient should receive a little x-ray to take care of the little bit of tumor left. The fallacy of such reasoning is obvious.

There are certain definite indications and contra-indications governing the use of such an important, beneficial weapon as Radiation Therapy, even in palliation and there are definite dangers in its indiscriminate use.

The prime considerations indicating the employment of the method are expected benefit to the patient by relief of pain together with extension of life and decrease in size of the lesion. The radiosensitivity of the tumor is a factor in the favorable palliative effect. It must be born in mind that radiosensitivity is a relative and variable factor and usually allows the response to occur with a relatively lower quantity of irradiation, but the tumor may frequently recur if adequate dose is not administered.

Occasionally a case presents itself wherein palliation alone can be hoped for and in which an adequate palliative dose is administered, complete eradication of the tumor may result.

An example of such experience is as follows.

Case 1.

Mr. , a 78-year-old, retired farmer, now in a State Hospital, with marked cardiovascular disease presented himself with a large carcinoma of the palm of the left hand, but with no epitrochlear or axillary metastases. In such lesions amputation of the hand would be the choice of curative therapy. Because of his advanced age, and heart disease a palliative dose of 3500r of superficial roentgen therapy was administered with eradication of the tumor. The usual cancericidal dose would have been 4500 to 5000r. One year later the tumor had not recurred and the explanation of the phenomenon is as follows: The cure rate of tumors as correlated to disage is not a fixed value.

Generalizing, a rough curve can be drawn demonstrating that with a certain small dose of radiation a low percentage of cures can result. As one increases the dose the percentage of survivals will increase to a certain point where further increase in dose will result in slight or no increase in survival rate and if the dose is increased too greatly the survival rate will decrease because of severe irreparable damage to the bed of the tumor and failure of healing. The optimal dose is, of course, that range in which the survival rate curve has leveled and does not increase further.

Modified from Paterson - The Treatment of Malignant Disease by Radium and X-rays

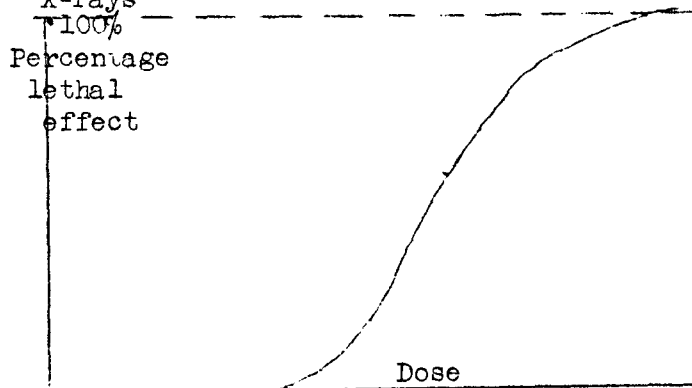


Fig. 1. 1.--The probable expression of the relationship between dose and lethal effect for one species of tumour.

In contrast to the beneficial effects of palliation one must balance the morbidity resulting from the treatment. Radiation sickness is a hazard some patients must tolerate to get the benefits. It is seldom so severe as to completely interfere with the schedule of treatments. The malady ends soon after the cessation of treatment. Numerous drugs have been used with each drug benefiting some patients, but a large percentage will not respond to any treatment for the radiation sickness.

The patient must be closely observed for development of leukopenia and anemia and these can be controlled with transfusions and prolongation of the interval of treatment, guided by the daily blood counts. Concomitant infection of the tumor may be worsened with the therapy, and should be closely observed. Frequently decrease of the dose early in the course of therapy may improve the infection.

Uremia is another complication in patients with extensive malignant disease which may be aggravated during roentgen therapy, especially at the onset of the course of treatment.

The most severe morbidity is suffered by those patients who are treated for lesions about the neck. If an adequate dose of radiation is given the skin reaction with reddening and occasional blistering reaching its peak at about the twenty-eighth day of the onset of treatment is extremely uncomfortable. The associated mucositis and pain on swallowing is most disturbing to the patient but with supportive treatment the course of radiation is tolerated and the untoward effects are improved in about two weeks following the height of the reaction.

A danger exists in the treatment of cachectic patients whose general condition is deteriorating rapidly that the radiation sickness associated with the therapy may further contribute to the downhill course and even on cessation of the treatments the untoward effects of the radiation may continue and aid in

the patient's demise. This principle can be compared to the surgical risk in a debilitated patient and should be considered in planning the therapy.

The dose of radiation in palliation should not be too great so as to cause persistent skin ulcers, radionecrosis of bone and resulting osteomyelitis as may occur in the mandible, or severe large areas of radiation chondritis. If our aim in palliation is to insure comfort to the patient a draining, painful radiation ulcer would, for example, defeat our purpose.

We must also bear in mind that in many patients in whom curative attempt by radiation or surgery is unsuccessful, palliation may have been accomplished. Let me again cite the case of gastric cancer resection as an example of this principle.

Another illustration of this point can be gained in Dr. McKelvey's cases of carcinoma of the cervix, stages III and IV treated with radiation. Decidedly less cures are obtained in these advanced stages as is done in stages I and II. These patients are all treated with a resulting cure rate of 29.5 per cent in stage III, 6 per cent in stage IV, as compared to 80 per cent in stage I and 54 per cent in stage II. However, the palliative effects in the advanced stages is not insignificant.

Case II

Mrs. , is a 44-year-old housewife who had post-coital bleeding in 1944. Her local physician cauterized her cervix at that time apparently without biopsy. In the last half of 1949 she developed pain, weakness and swelling of the right leg. A laparotomy in her home community revealed a right pelvic mass extending to the pelvic wall. A biopsy of the mass revealed squamous cell carcinoma, which was thought to be metastatic from the cervix which was removed by the cautery in 1944. The stage of the lesion was League of Nations stage III or IV.

A course of 3500 r/t was delivered to the pelvis. During the course of therapy the severe pain improved and on completion

of the treatment series she was ambulatory.

There are certain occasions in which radiation therapy has previously been used as the treatment of choice because the lesion was supposedly inoperable, and in which the curative results were poor but the palliation good. An example of this is in carcinoma of the hypopharynx or a large extrinsic carcinoma of the larynx which can not be removed by laryngectomy alone. Recently Dr. Harold Wookey of Toronto and Dr. Kremen have perfected special surgical techniques and with great skill have been able to resect the hypopharynx with reconstruction of the alimentary pathway by a subcutaneous skin tube. This has necessitated removal of the larynx as well. Any new method of treatment of malignant disease which may increase the five-year cure rate over the approximately 15 per cent achieved by radiation in carcinoma of the hypopharynx is deserving of trial. Only the passage of time will tell if this surgical procedure will produce a higher cure rate. It is obvious that the palliation in this surgical procedure is decidedly inferior to that of radiation therapy, and this factor must still be considered in the choice of therapeutic approach.

In this discussion of palliative radiation therapy it must be understood that we do not advocate the use of radiation therapy alone. The use of surgery has already been sufficiently stressed. Neurosurgical procedures in relief of pain, such as chordotomy, ganglionectomy, neurectomy and lobotomy are of extreme importance when the patient is in extremely great pain and no less radical procedure is available.

The adjunctive use of certain chemotherapeutic agents in widespread metastatic disease is of great importance. Unfortunately, many of these preparations such as nitrogen mustard have not proved too satisfactory because of short lived response. The use of hormone therapy in palliative treatment especially of metastatic carcinoma of

the breast and of the prostate is another excellent weapon.

As a general rule, those neoplastic lesions which are radio-resistant receive poor palliative results.

Such lesions as chondrosarcoma, neurofibroma and melanoma show little response to radiation therapy. Occasionally an exception to the general rule may occur. Adenocarcinoma of the stomach, small intestine and colon are resistant tumors. If large metastatic and inoperable masses are present in the abdomen secondary to lesions of the bowel, it is difficult to deliver the intense dose necessary for any response. The morbidity concomitant to the delivery of the irradiation in the large abdominal fields necessary would negate the possible benefits. However, it must be borne in mind if local distal metastases of an adenocarcinoma exist in an area where a moderate x-ray dose may be administered without undue morbidity, palliation might be obtained.

In contrast to this relative resistance of carcinoma of the colon, a carcinoma of the rectum will respond fairly well to palliative therapy.

Local recurrences so frequently seen after surgical resection of rectal carcinoma will get great relief of pain and diminution of tumor size with radiation.

The number of conditions in which radiation therapy is a palliative tool can be seen in Figure 1. It would be beyond the scope of this presentation to discuss more than a few of these conditions.

Case III

Mr. , age 20, developed back pain and progressive weakness in legs early in 1946. By September, 1946, on admission to the University Hospitals, he had complete paralysis of lower extremities and loss of sensation from T-5 caudad. On September 12, 1946, a bilateral laminectomy of T-1 to T-4 was done with subtotal removal of neoplastic tissue from the spinal canal. Histological examination demonstrated

this to be extra-dural infiltration of Hodgkin's disease. The operative procedure was followed by a course of x-ray therapy (1600r/a to upper thoracic spine in ten days), and the combined treatment resulted in perfect return of function and return of the patient to work on the farm.

In June, 1947, he received a course of x-ray therapy to enlarged cervical nodes bilaterally.

In June, 1949, he received a course of treatment to a large mass involving the sternum and the anterior mediastinum with good response. Following this he developed dyspnea, weakness, edema, progressing to marked anasarca, cyanosis, and marked distention of the great vessels of the neck. Roentgen examination revealed marked irregular enlargement of the cardiac shadow due to myocardial and pericardial lymphoblastomatosis infiltration.

Roentgen therapy directed to the heart and mediastinum from September 9, 1949 to September 29, 1949, resulted in marked improvement of all symptoms and findings and return of the patient to the farm. He was last seen on February 19, 1950, and has pulmonary infiltration which was present previously.

DISCUSSION:

In treatment of Hodgkin's disease and other forms of the lymphoblastomata such as lymphosarcoma and enlarged nodes of aleukemic leukemia, our aim is to give a moderate dose of between 1000r/t to 2000 r/t to the involved areas in fourteen days. Experience has shown that the nodes in the areas treated will not expand immediately. This is in contrast to the "hit and run" method advocated by many wherein a few hundred roentgens are given to hold the nodes in "check".

CASE IV

Mrs. . . . , a 37-year-old housewife

noted a mass in the left supraclavicular area in June, 1947. A node was removed in November, 1947, and was demonstrated to be a squamous cell carcinoma. A primary lesion could not be found on diligent search. A laparotomy was performed elsewhere in November, 1947, with removal of ovaries and tubes.

Deep x-ray therapy, and radon implantation to left cervical and supraclavicular areas eradicated the tumor. In July, 1948, she received successful radiation to a mass in the upper mediastinum and sternal area for another mass there. Bronchoscopy in search for a primary lesion was negative as well.

In September, 1949, because of cough, roentgen examination of the chest revealed a mass in the left hilum and atelectasis of the right upper lobe. A course of therapy to the lesion resulted in obliteration of the mass and re-expansion of the left upper lobe with complete improvement of symptoms.

Later in January, 1950, she developed a mass in the liver demonstrated at laparotomy for which she is now receiving x-ray therapy.

The importance of radiation therapy in metastatic carcinoma of the breast is well established. Its prime use is in osteolytic bone lesions, especially in weight bearing areas such as the femora, pelvis and spine. The bone pain is, as a rule, immediately improved and there is frequently filling in of the destructive area with new bone. Pathological fractures can be avoided in this manner and these patients can be kept ambulatory and free of pain, thus satisfying our aim in palliation. Pleural effusion due to pleural and pulmonary parenchymal metastases can be controlled by irradiation as do the mediastinal masses causing dyspnea and severe cough. Skin metastases and local recurrences are treated with adequate results. The aim of the treatment always is to keep the patient free of pain, ambulatory and capable of self care.

The development of hormonal therapy plays an equally important role in this function. Their value is especially marked in cases with widespread extent of the metastases. With successful results of steroid therapy the extent of radiation necessary is decreased and the steroids are more easily administered than irradiation, and decidedly less costly. Ovarian irradiation is a practical method of accomplishing sterilization as an adjunct in therapy through hormonal effect.

CASE V

Mrs. ., a 42-year-old housewife was first seen at the University Hospitals on September 28, 1949. She was eight and one-half months pregnant and had severe pain in the right hip. A hard, three centimeter mass was fixed to the skin of the right breast with a large node in the right axilla. Roentgenograms revealed multiple osteoblastic and osteoclastic metastases of the pelvic bones, right femur, lumbar spine, thoracic spine, ribs and skull. On September 30, 1949, she delivered her infant. Between October 5 to October 11, 1949, she received irradiation to the pelvis and lumbar spine which was computed to be 800 r/t to the center of the pelvis. This was followed by marked improvement in pain; the patient became ambulatory, showed complete disappearance of the palpable breast mass, axillary nodes and marked improvement in the roentgen appearance of the bone lesions.

The remarkable palliative response in this case was produced by the hormonal effect secondary to the x-ray sterilization.

It has become the trend or medical fashion today to treat neoplastic disease in tumor clinics. This has been an important advance in pooling knowledge and providing for choice of the best treatment for the varied types of tumors. The patients at times do not appreciate this team work. Many are frequently confused by the multiplicity of doctors and the constant change of

doctors seeing them at different visits to the clinic.

Excluding those patients who are inveterate visitors at the out-patient department the experience at the various clinics, services and laboratories is frightening to many even though they expect new and marvelous scientific achievement promised them here by their referring physician. When they arrive at the Radiation Therapy Department and possibly when admitted to the surgical ward for definitive treatment they look for hope and encouragement and frequently seek out one doctor who may give them sympathetic encouragement. When they are seen at the Tumor Clinic the question of whether they should be told they have cancer or not has previously been settled. Most patients know of their condition. From that point on peace of mind which is a most important feature of our goal of palliation "continuation of a relatively comfortable and pleasant existence" can only be achieved if they are led to believe that there is some faint hope for continued life ahead. Depriving them of any hope is an inconsiderate procedure and although the patient may be relatively free of pain, ambulatory and capable of caring for himself, he may be so mentally depressed that his remaining time may be as great a burden to himself and his family as if he were completely bed-ridden and in great pain.

X-ray therapy should not be used as psychotherapy; however, a little psychotherapy administered in conjunction with the x-ray in hopeless malignant disease is a great aid.

SUMMARY

There are definite indications for the use of palliative radiation therapy in malignant disease. The method should be utilized in those cases in which relief of pain, enhanced physical comfort, and ambulation with ability for self care can be expected. The possibility of use of other palliative agents such as chemotherapy and hormone therapy should be considered at the time of referral.

The few contra-indications in the use of radiation as a palliative measure have been discussed.

An attempt to establish a method for evaluation of the palliative results of cases treated so that more data can be collected for future study will be undertaken in the Radiation Therapy Department. In this regard we sincerely urge all clinicians who see the patients to record their opinion of the palliative results on the chart on follow-up visits of the patients to the clinics.

References

1. Paterson, R.
The Treatment of Malignant Disease
by Radium and X-rays.
Edward Arnold & Co., London, '48.
2. Smithers, D. W.
The Radiotherapist and the Cancer
Patient.
British Journal of Radiology, 20:
261-268, '47.

II.

MEDICAL SCHOOL NEWS

Coming Events

- March 6-8 - Continuation Course in Gastro-Intestinal Diseases for General Physicians.
- March 27-29 - Continuation Course in Dermatology for General Physicians.
- April 10-12 - Continuation Course in Pediatrics for Specialists.
- April 17-19 - Continuation Course in Gynecology for General Physicians.
- April 20-22 - Continuation Course in Cardiovascular Diseases for General Physicians.

* * *

Court Action Clears Way for Medical Research

As a result of recent court action, the Minnesota State Livestock and Sanitary Board has been freed from the restraining order preventing the issuance of licenses for the procurement of animals for medical research from public pounds. The Board is now considering applications from the University of Minnesota and the Mayo Foundation for licenses to procure experimental animals from such sources.

* * *

Faculty News

Dr. Irvine McQuarrie, Professor and Head of the Department of Pediatrics, reports that he has seen a large number of old Minnesota friends since he and Mrs. McQuarrie arrived at Laguna Beach, California, where they are at present vacationing.

Dean Harold S. Diehl will speak about his recent trip to Great Britain at the annual Founder's Day banquet of the Alumni Association of Phi Chi Medical Fraternity to be held at the Francis Drake Hotel on Saturday, March 4, at 6:30 p.m. Dr. Raymond N. Bieter, Professor and Head of the Department of Pharmacology, will act as the master of ceremonies at the banquet.

Dr. George E. Moore, Clinical Instructor in Surgery, has been selected to receive a \$500 grant-in-aid towards his expenses in attending the 5th International Cancer Congress in Paris.

The Department of Surgery has received recently an additional \$4,000 from the Atomic Energy Commission to extend its work in the detection of brain tumors.

* * *

III.

UNIVERSITY OF MINNESOTA MEDICAL SCHOOL
CALENDAR OF EVENTS

March 5 - ~~March~~ 11, 1950

No. 280Sunday, March 5

- 9:00 - 10:00 Surgery Grand Rounds; Station 22, U. H.
10:30 - 11:00 Surgical Conference; Rm. M-109, U. H.

Monday, March 6

- 8:00 - Fracture Rounds; A. A. Zierold and Staff; Ward A, Minneapolis General Hospital.
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; M-109, U. H.
10:00 - 12:00 Neurology Rounds; A. B. Baker and Staff; Station 50, U. H.
11:00 - Pediatric Rounds; Erling Platou; Sta. I, General Hospital.
11:00 - 11:50 Physical Medicine Seminar; E-101, U. H.
11:00 - 11:50 Roentgenology-Medicine Conference; Veterans Hospital.
11:00 - 12:00 Cancer Clinic; K. Stenstrom and A. Kremen; Eustis Amphitheater, U. H.
12:00 - 1:00 Physiology Seminar; A Motion Picture Study of Vocal Chord Abnormalities following Bulbar Poliomyelitis; William G. Kubicek; 214 M. H.
12:15 - 1:20 Obstetrics and Gynecology Journal Club; Staff Dining Room, U. H.
12:30 - 1:20 Pathology Seminar; Primary Carcinoma of the Ureter; Norman Jacob; 104 I. A.
12:30 - 1:30 Surgery Problem Case Conference; A. A. Zierold, C. Dennis and Staff; Small Classroom, Minneapolis General Hospital.
1:30 - 2:30 Surgery Grand Rounds; A. A. Zierold, C. Dennis and Staff; Minneapolis General Hospital.
1:30 - 2:30 Pediatric-Neurological Rounds; R. Jensen, A. B. Baker and Staff; U. H.
4:00 - Public Health Seminar; Subject to be announced; 113 Medical Sciences.
4:00 - Pediatric Seminar; Psychosomatic Aspects of Diabetes Melitus; Paul C. Benton; 6th Floor West, Child Psychiatry, U. H.
5:00 - 5:50 Clinical Medical Pathologic Conference; Todd Amphitheater, U. H.
5:00 - 6:00 Urology-Roentgenology Conference; D. Creevy, O. J. Baggenstoss and Staffs; M-109, U. H.

Tuesday, March 7

- 8:00 - 9:00 Fracture Conference; Auditorium, Ancker Hospital.
- 8:15 - 9:00 Roentgenology-Surgical-Pathological Conference; Craig Freeman and L. G. Rigler; M-109, U. H.
- 8:30 - 10:20 Surgery Seminar; Small Conference Room, Bldg. I, Veterans Hospital.
- 9:00 - 9:50 Roentgenology Pediatric Conference; L. G. Rigler, I. McQuarrie and Staffs; Todd Amphitheater, U. H.
- 10:30 - 11:50 Surgical Pathological Conference; Lyle Hay and E. T. Bell; Veterans Hospital.
- 11:00 - Contagion Rounds; Forrest Adams; Sta. L, General Hospital.
- 12:30 - Pediatric-Surgery Rounds; Drs. Stoesser, Wyatt, Chisholm, McNelson and Dennis; Sta. I, Minneapolis General Hospital.
- 12:30 - 1:20 Pathology Conference; Autopsies; J. R. Dawson and Staff; 102 I. A.
- 1:30 - 2:30 Pediatric Psychiatry Conference; R. A. Jensen and Staff; 6th Floor, West Wing, U. H.
- 1:00 - 2:30 X-ray Surgery Conference; Auditorium, Ancker Hospital.
- 2:00 - 2:50 Dermatology and Syphilology Conference; H. E. Michelson and Staff; Bldg. III, Veterans Hospital.
- 3:15 - 4:20 Gynecology Chart Conference; J. L. McKelvey and Staff; Station 54, U. H.
- 3:30 - 4:20 Clinical Pathological Conference; Staff; Veterans Hospital.
- 4:00 - 5:00 Physiology-Surgery Conference; Hypercarbia in Experimental Animals and in Anesthetised Patients; Fletcher Miller and E. P. Brown; Eustis Amphitheater, U. H.
- 4:00 - 5:00 Pediatric Rounds on Wards; I. McQuarrie and Staff; U. H.
- 5:00 - 6:00 Porphyrin Seminar; C. J. Watson, Samuel Schwartz, et al; Powell Hall Amphitheater.
- 5:00 - 6:00 X-ray Conference; Presentation of Cases by Doctors Nessa and Anderson, St. Cloud; Todd Amphitheater, U. H.

Wednesday, March 8

- 8:00 - 8:50 Surgery Journal Club; O. H. Wangensteen and Staff; M-109, U. H.
- 8:30 - 9:30 Clinico-Pathological Conference; Auditorium, Ancker Hospital.
- 8:30 - 10:00 Orthopedic-Roentgenologic Conference; Edward T. Evans; Room 1AW, Veterans Hospital.
- 8:30 - 12:00 Neurology Rehabilitation and Case Conference; A. B. Baker; Veterans Hospital.

Wednesday, March 8 (Cont.)

- 11:00 - Pediatric Rounds; Erling Platou; Sta. I, General Hospital.
- 11:00 - 12:00 Pathology-Medicine-Surgery Conference; Surgery Case; O. H. Wangensteen, C. J. Watson and Staffs; Todd Amphitheater, U. H.
- 12:00 - 1:00 Radio-Isotope Seminar; Diagnosis and Treatment of Hyperthyroidism; T. Wang; 113 Medical Sciences.
- 12:15 - Staff Meeting; Main Classroom, General Hospital.
- 3:00 - Pediatric Rounds; C. J. Huenekens; Sta. I, General Hospital.
- 3:30 - 4:30 Journal Club; Surgery Office, Ancker Hospital.
- 4:00 - 5:00 Infectious Disease Rounds; Basement Amphitheater, General Hospital.
- 5:00 - 5:50 Urology-Pathological Conference; C. D. Creevy and Staff; E-101, U. H.

Thursday, March 9

- 8:30 - 10:20 Surgery Grand Rounds; Lyle Hay and Staff; Veterans Hospital.
- 9:00 - 9:50 Medicine Case Presentation; C. J. Watson and Staff; M-109, U. H.
- 10:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; E-221, U. H.
- 10:30 - 11:50 Surgery-Radiology Conference; Daniel Fink and Lyle Hay; Veterans Hospital.
- 11:00 - 12:00 Cancer Clinic; K. Stenstrom and A. Kremen; Todd Amphitheater, U. H.
- 11:30 - Pathology Conference Clinic; Main Classroom; General Hospital.
- 11:30 - 12:30 Clinical Pathology Conference; Steven Barron, C. Dennis, George Fahr, A. V. Stoesser and Staffs; Large Classroom, Minneapolis General Hosp.
- 12:00 - 1:00 Physiological Chemistry Seminar; Structure and Metabolic Effects of Vitamin B₁₂; R. A. Aldrich; 214 M. H.
- 1:00 - 1:50 Fracture Conference; A. A. Zierold and Staff; Minneapolis General Hosp.
- 2:00 - 3:00 Errors Conference; A. A. Zierold, C. Dennis and Staff; Large Classroom, Minneapolis General Hospital.
- 4:15 - 5:00 Bacteriology and Immunology Seminar; Yeast in Feeding; G. W. Lones; 214 M. H.
- 4:30 - 5:20 Ophthalmology Ward Rounds; Erling W. Hansen and Staff; E-534, U. H.
- 5:00 - 6:00 X-ray Seminar; Meckel's Diverticulum; Donald Sterns; Todd Amphitheater, U. H.
- 7:30 - 9:30 Pediatrics Cardiology Conference and Journal Club; Review of Current Literature 1st hour and Review of Patients 2nd hour; 206 Temporary West Hospital.

Friday, March 10

- 8:30 - 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 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; E-221, U. H.
- 10:30 - 11:20 Medicine Grand Rounds; Veterans Hospital.
- 10:30 - 11:50 Otolaryngology Case Studies; L. R. Boies and Staff; Out-Patient Department, U. H.
- 11:00 - Pediatric Rounds; Erling Platou; Sta. I, General Hospital.
- 11:00 - 12:00 Surgery-Pediatric Conference; C. Dennis, O. S. Wyatt, A. V. Stoesser, and Staffs; Minneapolis General Hospital.
- 11:45 - 12:50 University of Minnesota Hospitals General Staff Meeting; Methemoglobinemia in Infants in Minnesota; A. B. Rosenfield; Powell Hall Amphitheater.
- 12:00 - 1:00 Surgery Clinical Pathological Conference; Clarence Dennis and Staff; Large Classroom, Minneapolis General Hospital.
- 1:00 - 1:50 Dermatology and Syphilology Conference; Presentation of Selected Cases of the Week; H. E. Michelson and Staff; W-312, U. H.
- 1:00 - 3:00 Pathology-Surgery Conference; Auditorium, Ancker Hospital.
- 1:00 - 2:50 Neurosurgery-Roentgenology Conference; W. T. Peyton, Harold O. Peterson and Staff; Todd Amphitheater, U. H.
- 3:00 - 4:00 Neuropathology Conference; F. Tichy; Todd Amphitheater, U. H.
- 3:00 - 6:00 Demonstrations in Cardiovascular Physiology; M. B. Visscher, et al; 301 M. H.
- 4:00 - 5:00 Clinical Pathological Conference; A. B. Baker; Todd Amphitheater, U.H.
- 4:15 - 5:15 Electrocardiographic Conference; Coronary Insufficiency and Infarct; E. Simonson; 106 Temp. Bldg., Hospital Court, U. H.

Saturday, March 11

- 7:45 - 8:50 Orthopedics Conference; Wallace H. Cole and Staff; M-109, U. H.
- 8:00 - 9:00 Surgery Literature Conference; Clarence Dennis and Staff; Small Classroom, Minneapolis General Hospital.
- 8:30 - 9:30 Surgery Conference; Auditorium, Ancker Hospital.
- 9:00 - 11:30 Neurology Conference; Headache; Veterans Hospital Annex.
- 9:00 - 9:50 Medicine Case Presentation; C. J. Watson and Staff; E-221, U. H.

Saturday, March 11 (Cont.)

- 9:00 - 10:30 Pediatric Grand Rounds; I. McQuarrie and Staff; Eustis Amphitheater, U. H.
- 9:00 - 11:30 Surgery-Roentgenology Conference; Todd Amphitheater, U. H.
- 10:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; E-221, U. H.
- 10:00 - 12:50 Obstetrics and Gynecology Grand Rounds; J. L. McKelvey and Staff; Station 44, U. H.
- 11:00 - Contagion Rounds; Forrest Adams; Sta. L, General Hospital.