From the point of view of influencing people to come earlier for treatment the fate of the advanced patient has an adverse effect. As Donaldson (1952) points out, an enormous number of people are brought into direct contact with cancer every year through nursing relatives dying at home. Their attitude and that of the group around them are influenced by these experiences. At the time of increasing anxiety when the patient begins to go downhill the hospital may give him a longer appointment, and his own doctor, it is sometimes alleged, "doesn't seem to take the same interest now." Perhaps he cannot get a bed in hospital, and living conditions may be unsuitable or squalid. He may be inadequately sedated. Worst of all is the feeling that nothing is now being done for him. This is cancer as the general population knows it—unpleasant, incurable, and rejected. These are not entirely welfare considerations; they have a direct bearing on the public's lack of confidence in what can be done for the cancer patient.

A policy of silence regarding a diagnosis of cancer is maintained in general in this country in the supposed interests of the patient. Is this done at the cost of diminishing public confidence in the value of treatment? The fact of palliative treatment is not understood, and hospitals appear to be trying to cure all their patients and failing in a high proportion of cases. If the patient does well the condition "cannot have been cancer." The known cured cancer case is a rarity. This is not the place to discuss what should be done about it, but the fact is entirely relevant to the findings of this study. It is clear that one of the causes of delay is lack of confidence in the efficacy of any treatment. In some way or other it must be brought home to people that some types of cancer are not only curable but are being cured in early cases.

Summary

A study, based on detailed interviewing of 314 patients with cancer of the breast, cervix uteri, skin, or mouth showed that approximately one-half delayed seeking advice for three months or more, and a quarter for a year or more, after first noticing symptoms. Most of the patients with breast cancer suspected they had cancer; patients with the other three types of cancer were, in the main, ignorant of the significance of their symptoms. There was greater delay among those who suspected cancer than among those who did not. Two quite distinct processes operate to cause delay.

1. *Ignorance*.—Here, delay in seeking advice clearly reflects the patient's general attitude towards "doctoring" and has no special relationship to cancer as such.

2. *Fear* (of cancer).—This is clearly indicative that, in some degree at least, the patient really "knows" the probable nature of the disease. Such fear may trigger a reasonable response and make for "immediate" action. Much more often, in the group analysed, it inhibited rational action and was the underlying factor causing delay, although this was camouflaged behind a variety of more superficial ostensible reasons. Testing by the Wechsler-Bellevue intelligence scale indicated that there was no significant relationship between delay and intellectual level as measured by this test.

These distinct and mutually exclusive attitudes to the different diseases must be recognized in any schemes for public education in this field.

We are indebted to Mr. J. C. Kenna, lecturer in clinical psychology, University of Manchester, for advice on psychological testing, and to Miss E. F. May and Mrs. P. F. R. Venables for carrying it out.

REFERENCES

- Donaldson, M. (1952). *Med. Offr.* **88**, 247.
Harms, C. R., Plaut, J. A., and Oughterson, A. W. (1943). *J. Amer. med. Ass.*, **121**, 335.
Shands, H. C., Finesinger, J. E., Cobb, S., and Abrams, R. D. (1951). *Cancer (N.Y.)*, **4**, 1159.

EARLY CANCER DETECTION AND EDUCATION: A PILOT TRIAL

BY

J. WALTER, B.M., F.F.R., M.R.C.P., D.M.R.E.
*Deputy Medical Director, Sheffield National Centre for
Radiotherapy*

AND

E. C. ATKINSON, M.B., B.S., D.L.O.
General Practitioner

Every clinician in the field of cancer finds that a large proportion of patients coming for treatment at present must be classed as "late" cases, in which radical cure cannot be expected. Our thesis is that many of these cases could and should have been diagnosed and treated at a much earlier stage. Efforts to reduce the delay have been on two main lines: (1) education of the public by suitable propaganda, and (2) medical examination.

Present Investigation

The Ministry of Health, in a recent circular, considers public propaganda inadvisable at present but favours local exploratory schemes to enlarge our knowledge of the possibilities.

We have sought to combine some of the advantages of both the above methods—education and examination. We feel that cancer education is desirable, but should be conducted as personally as possible between physician and patient. Education and medical examination can and should be carried out together.

It was decided to offer all the patients between the ages of 40 and 70 on the National Health Service list of one of us a brief examination conducted specifically to detect early accessible cancer and to combine this with an effort at education in the cardinal symptoms of malignant disease. The women were invited first.

Circular letters were sent out in batches, offering free medical examination; stamped envelopes and reply forms were enclosed. The word "cancer" was avoided at all times, if possible, as being in itself a potent agent of distress.

Female Patients

Invitations were sent to 766, and 422 (55%) accepted. This, we felt, was a very satisfactory response. The examinations were carried out in batches of about 20 at one session a week, lasting about 2½ hours. The patients' National Health Service cards were available to assist rapid visualization of their histories.

After taking a careful menstrual history, with special reference to heavy or irregular bleeding and discharge, leading questions were asked concerning the following: regularity of bowels, unusual constipation or diarrhoea, blood in motions, piles, abdominal pain, sore places in mouth or throat, dysphagia, dysuria, haematuria, cough, hoarseness, moles or warts, lumps or swellings, usual weight, smoking habits.

If the answers appeared unsatisfactory, further inquiry was made and all the facts were noted. The mouth, tongue, pharynx, and larynx were then examined, including indirect laryngoscopy, and the neck was inspected and palpated. The patient then passed into the undressing-room, where she was instructed to take off all her clothes and to put on a dressing-gown provided. She then passed on into the examination room, where the body was inspected, the

breasts were examined, the abdomen was palpated, and a manual and speculum vaginal examination and a digital rectal examination were made. While the doctor conducted the breast, etc., examination he took the opportunity of telling each patient that she should feel the breasts every month and at once report any swelling, and that she should always report any irregular bleeding or discharge, etc.

No attempt was made to examine the heart, lungs, or central nervous system. If any feature of the history brought out the need for such an examination it was arranged for at another time in the ordinary consulting hours. No pathological investigations were undertaken; it was considered that if any indication for special examination was present the patient should be referred to an appropriate consultant in the same way as if she had attended as an ordinary surgery patient. All examinations were purposely confined to the scope of ordinary general practice, and no attempt was made to set up a hospital-type diagnostic centre. At the conclusion of the examination each patient was given a pamphlet, listing the chief warning signs (lumps, bleeding, hoarseness, dysphagia, etc.) to be reported without delay, and emphasizing the importance of *not waiting till pain was felt*.

Recall Examinations.—Inevitably, a number of conditions were met which, while being obviously abnormal, were insufficiently well defined to merit any immediate action. These were cases for recall in three to six months—for example, some erosions, vague swellings in the pouch of Douglas, and unsatisfactory menstrual histories. The actual process of recall set a major problem, how to proceed without causing alarm and anxiety. At first, patients were told quite briefly that they would be sent for again in three months for re-examination. But experience quickly showed that they worried in the meantime and thought all sorts of things had been discovered. After trying various alternatives, we eventually decided to send each a personal note near the time of recall, offering another appointment in view of the previous findings; this had the desired effect. The recall problem is certainly one of the major difficulties of a scheme such as ours.

Results.—The principal findings are listed in Table I. Only one new major cancer was discovered (of breast). Eight patients were referred to gynaecologists for opinion

TABLE I.—Principal Results of Survey in Females

Invitations issued	766
Acceptances	422 (55%)
New cancer discovered	1 Breast (radical mastectomy performed; histologically confined to breast, no axillary secondaries)
Referred to hospital, excised, and proved benign	8 { 1 Recurrent lipoma of arm 3 Uterine fibroids 1 Ovarian cyst 1 Cervix papilloma 1 Palate 1 Thyroid adenoma
Follow-up examination for doubtful findings	32 { 21 Pelvis (uterus, ovary) 5 Breast (including 1 case of bleeding nipple, under regular observation) 4 Rectum (polypi) 2 Larynx (papilloma)
Miscellaneous	3 { 1 Dyspareunia—operation performed 1 Procidencia— 1 Larynx chondroma "asymptomatic"

on masses in the pouch of Douglas. Three have had hysterectomies for fibroids, one was discovered at laparotomy to have secondaries from a previous carcinoma of the colon, two proved to have benign ovarian cysts, and the other two refused operation. Abnormal pelvic tumours are not rare, and must always arouse suspicion. Ovarian cysts, benign or malignant, are usually symptomless for a long time, but can be felt on pelvic examination at an early stage. They represent a fertile field for prophylaxis, for benign cysts can probably become malignant, and the present-day poor results in ovarian carcinoma cannot be improved without early removal of enlarging pelvic

tumours. *This can be achieved, not by education of the patient in early symptoms, but only by periodic pelvic examination.*

Male Patients

Invitations were sent to 716 patients, and 415 (58%) accepted. The same type of history was taken and the same leading questions (where appropriate) were put. A similar examination was conducted, including mouth, pharynx, larynx, abdomen, genitalia, and rectum.

As a concession to an almost universal anxiety among men of this age group it was decided to take the blood pressure in every case. In only one instance was it found necessary to refer a young hypertensive to a physician. Practically the entire remainder were told that the reading was satisfactory and the expressions of relief and appreciation were constant.

Results.—These are summarized in Table II. No new major cancer was discovered primarily, but the pre-malignant and potentially malignant lesions discovered and

TABLE II.—Principal Results of Survey in Males

Invitations issued	716
Acceptances	415 (58%)
Minor new cancer discovered	1 Rodent ulcer of face (treated by x-rays, healed)
Pre-malignant or doubtful lesions, under observation	9 { 1 Larynx—chronic hypertrophic laryngitis. Biopsy taken, showed suspicious areas without definite invasion 3 Larynx—papillomata 1 Penis—erythroplasia 2 Early rodent ulcers of face 1 Testis—nodule 1 Enlarged bilateral axillary lymph nodes
Benign lesions referred to hospital	4 { 1 Cyst of hand 1 Advanced osteoarthritis of hip (on waiting-list for arthroplasty) 1 Dyspnoea (fully investigated—final diagnosis of "chronic bronchitis") 1 Molluscum sebaceum of nose (treated by curettage, healed)

kept under observation are noteworthy. Slow-growing tumours such as these carry generally a good prognosis with early removal when appearances justify active treatment.

Benign Lesions Discovered

In any series of medical examinations, however superficial, a number of benign lesions, inflammatory, neoplastic, degenerative, etc., will inevitably be discovered. Although it was not our intention to search for such common things, note was made of the obvious benign lesions as they appeared in the systems examined. Vaginal examination, for example, revealed 43 cases of cervical erosion and 10 cases of urethral caruncle. In none of these was treatment thought to be indicated. Other benign lesions found included cervical polyp, uterine fibroid, Bartholin cyst, "chronic mastitis," goitre (common in this region, on the edge of Derbyshire), and laryngeal chondroma.

An enlarging thyroid adenoma (a potentially malignant lesion) was treated by excision. One case of dyspareunia and one of procidencia were also sent to hospital and treated surgically.

Repeat Survey of Female Patients

Following the initial survey of both sexes, it seemed desirable to attempt to repeat the examination, at least in the women. Of the 422 initially examined, second acceptances were obtained in 170 (or 40%). Some drop, of course, was inevitable, and a similar experience was found by Siddall (1952).

This time we were able (by the kind help of Dr. G. R. Osborn, of the Derby Royal Infirmary) to extend the investigation by including a routine vaginal smear, by the method of Papanicolaou (Papanicolaou and Traut, 1943; Osborn, 1953).

The chief results are summarized in Table III.

TABLE III.—*Principal Results in Second Female Survey*

Invitations issued	422	That is, the "acceptances" of Table I
Acceptances	170 (40%)	
Vaginal smear examinations	170	2 showed trichomonas infection 1 showed doubtful neoplastic cells
Minor operations	2	Enlarging pigmented papilloma on abdomen; excision—histologically benign Cervical polyp removed—histologically benign
Miscellaneous	6	Referred to hospital for benign conditions (cervicitis, etc.)

Undetected Cancers

It is clearly of major importance to determine the number of cancers "missed" by our survey, as shown by the subsequent history of the patients. To this end Table IV has been compiled, with details of all the cancer cases that have been diagnosed in patients examined, beginning from the date of the first examination (July, 1951) to the present—

TABLE IV.—*Malignant Cases Appearing Subsequent to Examination*

No.	Site of Cancer	Sex and Age	Alive or Dead	Length of History of Symptoms	Interval from Examination to Diagnosis	? Cancer Present at Time of Examination	Value of Examination or Education
1	Colon	M 54	Alive	2 weeks	3 weeks	Yes	Prompt attendance definitely due to pamphlet
2	Bladder	M 50	"	" Cystitis " 3 months; haematuria 2 days	1½ years	No	No definite effect
3	Stomach	M 64	Dead	1 month	1½ "	"	No effect. (Old gastric history. Neurotic subject)
4	Colon	M 52	Alive	2 weeks	1 year	"	No definite effect. (Early attendance because of primary symptom of pain)
5	Stomach	F 44	Dead	Indefinite	1 "	"	No value. (Symptoms from secondaries only)
6	Brain	F 42	"	1 week	2 months	Yes	No value
7	Breast	F 47	Alive	1 day	1 year	No	Early self-detection through pamphlet
8	Bladder	F 57	Dead	1 week	6 months	Yes	No definite value

a period of 2 years 9 months. Column 6 gives the time interval from our examination up to the appearance of symptoms relative to the cancer, and the next column attempts to estimate whether the growth was present at the time of our examination. This estimate is necessarily personal and subjective, and apt to be very wide of the mark; it is well known that microscopically recognizable cancer can be present many years before giving signs; our "Yes" or "No" is often rather an answer to the question, Could the cancer probably have been detected by more detailed and thorough investigation at the time?—and even the answer to this more limited question is subject to a very considerable margin of error. The last column attempts to assess the actual value of the examination or propaganda as judged by the patient's subsequent history; here again considerable uncertainty enters, but we felt it important to make some attempt of the kind, if only as a basis for argument.

From column 7 it will be seen that we consider cancer to have been present but undetected by us at the time of our examination in three cases (Nos. 1, 6, and 8). In Case 6, of cerebral glioma, although symptoms of "rheumatism" appeared only two months after our examination, it is highly improbable that more thorough clinical examination by ourselves at the time would have detected anything abnormal or altered the prognosis. Case 8 was examined in January, 1952, and at the time was on the waiting-list at hospital for treatment of urethral caruncle; in March dysuria and frequency set in, and she was sent to hospital again, but the symptoms were attributed to the caruncle and she had to wait till June before being admitted as an emergency with acute retention; cancer was quite unsuspected, being discovered only on cystoscopy; it is difficult to blame anyone for this sequence of events, and nothing short of routine cystoscopy—clearly quite impracticable—could have revealed the growth sooner.

Case 2 was examined in June, 1952, and there was then some history of mild dysuria; no physical signs were found, but a note was made on the patient's card advising

reference to a urologist if symptoms persisted. His next attendance was in December, 1953, with symptoms of cystitis for the past three months; treatment for cystitis was begun, but he did not reappear till February, 1954, with two days' haematuria; cystoscopy showed multiple papillomata, one of them infiltrating and malignant. With retrospective wisdom, we might blame ourselves for not following up his original dysuria in June, 1952; the symptoms apparently improved spontaneously and an ordinary bout of cystitis gives the same clinical picture. It he had been examined cystoscopically, papillomata would presumably have been discovered, and active treatment of these might possibly have prevented the later malignant degeneration. This case, as well as No. 8 above described, underlines the value of early cystoscopy; clearly, it is an impracticable counsel of perfection to submit all cases of cystitis to this inconvenience, and a line must be drawn somewhere—just where, is the problem before us.

Cases 1 and 7 represent undoubted triumphs for the educational campaign. In Case 1 the patient stated that it

was certainly the pamphlet that was responsible for his reporting so soon; since his symptoms began only one week after his examination, the warnings would be fresh in his memory. In Case 7 the nodule in the breast was reported at once—it was less than 1 cm. in size, one of the smallest we have ever seen. Radical mastectomy was carried out, but microscopically invasion of lymphatics was evident, with secondaries in axillary nodes. In spite of post-operative radiotherapy, recurrence on the chest wall followed and the prognosis is virtually hopeless. This is an example of the biologically virulent type of growth which metastasizes from the start.

Additional evidence of the potential value of education comes from the fact that some half-dozen patients have reported since the start of the examinations, for rectal bleeding—all of them mentioning the pamphlet with its warning. All of these cases proved to be due to haemorrhoids.

Financial Cost

The chief items of expenditure were for the services of the secretary-chaperon, duplication of circulars, envelopes, and postages (including stamp enclosed for reply).

Fifty-five sessions were held and about 1,000 examinations carried out. The total cost was approximately £150.

The medical man-hours totalled about 140, but in this experimental survey the question of payment for medical services did not arise.

Discussion

Detectable Cancers

With the type of examinations we have used, "detectable" will necessarily approximate to "accessible." What proportion of total cancer will this include? Using the figures of Tod (1949) for estimated incidence in different organs for England and Wales, we may attempt an answer as follows: Out of a total incidence of 2,112 cases per million of population we may place in the "accessible" group the sites listed in Table V, giving 977—that is,

TABLE V.—List of "Accessible" Cancers, and Incidence
(Abstracted from Tod, 1949)

Site	Incidence per Million
Skin	200
Lip	16
Tongue	27
Mouth	10
Jaw (including antrum)	12
Palate	4
Pharynx (including tonsil)	18
Larynx	29
Breast	225
Parotid	5
Thyroid	8
Rectum and anus	156
Male genitals	10
Prostate	56
Uterus	132
Ovary	56
Vulva and vagina	13
	977

approaching one-half. The largest groups among the "inaccessible" types are: lung and mediastinum (171), oesophagus (54), stomach (322), other intestine (including liver and pancreas) (389), bladder (48), Hodgkin's disease and leukaemia (51)—all these together total 1,035.

From Table V it is clear that the cancers most likely to be "picked up" are: skin, breast, rectum, and uterus. Of these, the skin is the least important from the present standpoint, as the mortality is relatively low. The most dangerous of skin cancers is the malignant melanoma; there is a useful field for prophylaxis here in the removal of doubtful moles and pigmented patches, especially from sites exposed to friction and trauma.

The factor of expense has ruled out even the simpler supplementary tests such as urine analysis, Wassermann reaction, and blood counts. Since we had no intention of providing a general medical examination, we felt no compunctions about omitting these tests, as their contribution to cancer detection could not be considerable. Blood counts might have picked out, for example, a case of leukaemia, especially of the chronic lymphatic type in the elderly, where it may be almost symptomless. But leukaemias, like the reticulososes generally, are not such urgent candidates for early detection as the common carcinomas, as their ultimate prognosis is scarcely influenced by earliness or lateness of detection.

There are at least two ancillary investigations, however, that are reasonably practical politics and of real value in "large-scale" cancer detection—the chest x-ray film and the vaginal smear.

Chest X-ray Film.—Some recent results of the largest mass chest x-ray survey so far made are given by Guiss (1952); in 1,867,201 people, 3,500 "suspects" were found, and after investigation 144 carcinomas were confirmed; the operability rate (57%) and resection rate (47%) were relatively very high. Boucot and Sokoloff (1954), however, are much less optimistic about its possibilities. To be of real value the surveys would need to be repeated at intervals of, at most, six months.

Vaginal Smears.—The experienced pathologist can pick out cancer cells, even in isolation, that have been exfoliated from a malignant growth. The method has been used extensively in the U.S.A., especially as a screening test for large groups, and there is no question about its ability to pick out cancers, both of the cervix and of the body of the uterus, at a stage long before they are clinically apparent. The method has, in fact, led to increasing interest in, and detection of, the "carcinoma *in situ*"—that is, in the pre-invasive stage, when malignant changes are still confined to the epithelium. A recent example of its value is given by Erickson (1953): in 20,000 women of the general population screened there were 1.8% of "positive and suspicious" findings; subsequent biopsies showed about half of them to have carcinoma of the cervix, intra-epithelial or invasive. Siddall (1952), in an investigation comparable with the present one, found three early cancers of the cervix by this method in 563 apparently well women. The drawback of the technique is the relatively great length

of time required for examination of the smears, as well as the scarcity of experienced workers. This has so far confined its use in this country mainly to the gynaecological departments of a few large hospitals—that is, to patients with some complaint; here it has been found of undoubted value (Discussion, 1951).

Other Diagnostic Aids.—Investigations such as smears of gastric aspirations, routine sigmoidoscopy, etc., have been used in the U.S.A., but are practicable only in hospital, and can hardly be used on a large scale. Serological tests for cancer have also proved very disappointing so far.

Is Early Treatment Essential?

The orthodox assumption that early treatment, before spread takes place, should in general be curative has been under heavy recent criticism. On the basis of breast cancer statistics, McKinnon (1952a, 1952b) and Park and Lees (1951) conclude that the survival rate is not appreciably influenced by treatment; delay is therefore not of prime importance, and "curability" is explicable wholly by intrinsic variations in growth rate. Foulds (1951) emphasizes the complex characters of growths—rate of growth, invasiveness, aptitude for dissemination, etc., are not necessarily in step in a particular growth. Considerations of this nature help to explain the paradoxical findings that a short history of symptoms is not necessarily a good prognostic index and may even be the reverse (Walters, Gray, and Priestley, 1941; Harnett, 1953; Swynnerton and True-love, 1952). *But this does not imply that there is no difference in survival rates of patients treated in the early or later stages of the disease* (Russ, 1953): all Stage 2, 3, and 4 cases will at one time have been Stage 1 cases, and if treated during Stage 1 would presumably give some at least of the superior results of Stage 1 cases.

The concept of an "early" case is clearly not as simple as was once thought, and clinical "early" cases may be pathologically late (compare Case 7 above). But, as pointed out by Kreyberg (1953) and Kreyberg and Christiansen (1953), who found that 50% of clinically very early breast cancers eventually succumbed to secondaries, early diagnosis and treatment are still of great importance, as we cannot know beforehand who will benefit. Even if the benefit is statistically modest, early treatment of the primary usually gives improved palliative effects, which are normally neglected in cancer statistics.

With the exception of the two extremes of biological virulence, earlier detection and treatment of the large intermediate group seem to hold out the best present-day hope of improvement.

Some Results in Cancer-Detection Work

The American Cancer Society (1949) quoted 0.8% cancers and 10% pre-cancerous lesions in a mixed group of 51,728 symptomatic and asymptomatic patients seen in detection centres throughout the country. Jones and Cameron (1950), from their data, estimate a potential case-finding rate of 1%. Clifton and Rush (1951) report 1.2%, while 2.6% of known cancer subjects were found to have a second malignant tumour.

Siddall (1951, 1952) reports a survey in general practice, more nearly comparable to ours, confined to women. During eight years 1,131 patients were seen; 14 cancers were found in the asymptomatic group and 22 in those with symptoms.

Psychological Aspects

This side of the problem demands the most careful consideration. Indiscriminate publicity can do a great deal of harm. Cancerphobia is common, and medical examination and reassurance can do much to combat it. Its victims, however, may promptly transfer their anxiety to some other field—for example, cardiac. The problem is not that of cancerphobia specifically, but the vastly greater one of neurosis generally.

Our own experience parallels that of Siddall (1952), who found that his patients with cancerphobia could all be

considerably or completely relieved, and that the psychological benefits outweighed the disadvantages.

As an example of the confusion and ignorance in the public mind, as the basis of so much fear and worry, it is worth noting the results of a recent questionnaire to the general public reported by Raven (1953)—17% thought cancer was infectious, 27% that it was incurable, and 20% that it was of doubtful curability.

Other Aspects

In the U.S.A. the average cost per case of cancer discovered has been estimated at anything from 1,000 to 8,000 dollars—clearly prohibitive here. On this score alone, the general practitioner's consulting-room is preferable. Moreover, it is work of a type that enhances the scope of general practice (unlike so many proposals). Conclusions about the value of periodic examinations can be reached only on the basis of large-scale surveys, with adequate follow-up. A suitable agency would appear to be the health centre, of the type recently built, and the financial cost would be relatively low.

Summary

This paper describes a survey in a general practice, in which clinical medical examination was offered to patients between the ages of 40 and 70 combined with instructional propaganda in early cancer symptoms. Four hundred and twenty-two women and 415 men responded, making acceptance rates of 55% and 58%. A follow-up examination on the women was also carried out, including a vaginal cytological smear, bringing the total of examinations to about 1,000.

The findings are reported, with details of malignant and non-malignant lesions discovered.

Some of the arguments for and against such examinations and their possible value in cancer morbidity and mortality are discussed. The psychological and financial aspects are also touched on.

It is concluded that further experimental trials on similar lines would be justified, and are necessary before any appraisal of their long-term value can be made.

Our grateful thanks for the initial grant towards expenses are due to the Sheffield Regional Hospital Management Committee No. 4 (chairman, Sir Ronald Matthews) and its secretary, Captain T. W. Barnard, who gave invaluable help at all stages. Also to the Sheffield Regional Hospital Board for a continuation grant. We would also thank Sir Ernest Finch and Professor Sidney Russ for their interest, encouragement, and help. On the medical side, we are indebted to the kindness of Dr. G. R. Osborn for enabling us to include the vaginal smear examinations; all the material was examined by him. For laboratory assistance we are grateful to Mr. L. R. Reeves, F.I.M.L.T., of the Sheffield National Centre for Radiotherapy, and for secretarial help to Miss B. Wheatley and Mrs. R. Martin.

REFERENCES

- American Cancer Society (1949). *Proceedings of First National Cancer Conference*, pp. 276-290. New York. Quoted from Clifton and Rush, (1951).
- Boucot, K. R., and Sokoloff, M. J. (1954). *Amer. Rev. Tuberc.*, **69**, 164.
- Clifton, E. E., and Rush, B. (1951). *Surg. Gynec. Obstet.*, **93**, 719.
- Discussion (1951). *Proc. roy. Soc. Med.*, **44**, 305.
- Erickson, C. C. (1953). Quoted from *Lancet*, 1953, **1**, 981.
- Foulds, L. (1951). *Ann. roy. Coll. Surg. Engl.*, **9**, 93.
- Guiss, L. W. (1952). *Cancer (N.Y.)*, **5**, 1035.
- Harnett, W. L. (1953). *Brit. J. Cancer*, **7**, 19.
- Jones, H. W., and Cameron, W. R. (1950). *J. Amer. med. Ass.*, **143**, 228.
- Kreyberg, L. (1953). *Brit. J. Cancer*, **7**, 157.
- and Christiansen, T. (1953). *Ibid.*, **7**, 37.
- McKinnon, N. E. (1952a). *Surg. Gynec. Obstet.*, **94**, 173.
- (1952b). *British Medical Journal*, **1**, 544.
- Osborn, G. R. (1953). *Applied Cytology*. London.
- Papanicolaou, G. N., and Traut, H. F. (1943). *Diagnosis of Uterine Cancer by the Vaginal Smear*. New York.
- Park, W. W., and Lees, J. C. (1951). *Surg. Gynec. Obstet.*, **93**, 129.
- Raven, R. W. (1953). Quoted from *British Medical Journal*, 1953, **1**, 502.
- Russ, S. (1953). *British Medical Journal*, **1**, 580.
- Siddall, A. C. (1951). *J. Amer. med. Ass.*, **145**, 314.
- (1952). *Amer. J. Obstet. Gynec.*, **64**, 168.
- Swynnerton, B. F., and Truelove, S. C. (1952). *British Medical Journal*, **1**, 287.
- Tod, M. (1949). *An Inquiry into the Extent to which Cancer Patients in Great Britain Receive Radiotherapy*. Sherratt and Hughes, Altrincham.
- Walters, W., Gray, H. K., and Priestley, J. T. (1941). *Surg. Clin. N. Amer.*, **21**, 1099.

RECENT DEVELOPMENTS IN THE MANAGEMENT OF BRAIN ABSCESS*

BY

WALPOLE LEWIN, M.S., F.R.C.S.

Assistant Neurological Surgeon, Radcliffe Infirmary, Oxford

During the last ten years there have been considerable advances in the diagnosis and treatment of brain abscess. Of overriding importance has been the introduction of the antibiotics, but superior methods of location, and experience in the methods of treatment available, have all contributed to the improved results. Thus in the Department of Neurological Surgery, Oxford, the mortality has fallen steadily (Table I). The earlier series

TABLE I.—Brain Abscess, 1938-54

Years	No. of Cases	Deaths
1938-43 (before penicillin)	48	22 (46%)
1944-48	62	18 (29%)
1950-54	36	7 (19.4%)

have been described previously (Pennybacker, 1951), and in the present paper the results over the last four years (1950-4) are recorded. During this period there were 36 cases with 7 deaths, a mortality of 19.4%. Concerning these seven deaths it should be noted that three of the patients had been admitted at a late stage, when the abscess had already burst into the ventricle and ventriculitis was established, and one other patient had had multiple abscesses.

In trying to assess these results, the bare figures do not perhaps tell the whole story, since in later years there have been an increasing number of acute cases (including metastatic abscesses, particularly from the chest) reaching neurosurgical clinics for treatment, which may weight the results adversely. The modern trend is perhaps best reflected in the treatment of abscesses resulting from paranasal sinus and otogenic infection: of 20 consecutive patients with abscesses from these sources in the last four years, 19 recovered and 1 died. However, a brain abscess is still a serious matter, and in looking to the future one should not only be seeking for further improvement in diagnosis and treatment but be attempting to reduce the incidence of brain abscess by attention to the sources of infection and also criticizing the quality of the result obtained.

Sources and Prevention

There is a general impression that brain abscess is less common than used to be the case, and this may well be so. No dramatic change is yet shown, however, in the incidence from neurosurgical clinics, but this may be due to the fact that diagnosis is much better than formerly and more cases are now recognized and sent for treatment.

TABLE II.—Source of Infection in 36 Cases, 1950-4

	No. of Cases	Deaths
Frontal sinusitis	5	1
Mastoiditis { Temporal lobe	14	0
Cerebellum	1	0
Chest infections	4	2
Metastatic from other sources	4	2
Direct implantation (penetrating wounds, etc.)	4	0
Infection of face, scalp, and facial bones	4	0
	36	7

The sources of infection in this series are shown in Table II. The common cause of abscess is *paranasal sinus and ear infection*, and it would indeed be surprising if the better social conditions of recent years and the greater

*Read in the Section of Neurology at the Annual Meeting of the British Medical Association, Glasgow, 1954.