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WORLD HEALTH ORGANIZATION
TECHNICAL REPORT SERIES

No. 422

EARLY DETECTION OF CANCER

Report of a WHO Expert Committee

WORLD HEALTH ORGANIZATION

GENEVA

1969

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PRINTED IN FRANCE

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WHO EXPERT COMMITTEE ON EARLY DETECTION OF CANCER

Geneva, 11-16 November 1968

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EARLY DETECTION OF CANCER

Report of a WHO Expert Committee

A WHO Expert Committee on Early Detection of Cancer met in Geneva from 11 to 16 November 1968.

The meeting was opened on behalf of the Director-General by Dr P. Dorolle, Deputy Director-General, who extended a welcome to the representatives of the International Union Against Cancer and the International Federation of Gynecology and Obstetrics.

1. INTRODUCTION

Present statistics indicate that more than 50 % of all cancer patients could be cured if the disease were diagnosed in its earliest stages and if prompt and appropriate treatment were given. In order to reach this goal, it will be necessary to institute extensive programmes utilizing all available detection, diagnostic and therapeutic techniques.

The components of a cancer control programme are prevention, early detection, diagnosis, treatment, follow-up, after-care, and rehabilitation. The overall aim is to decrease incidence, morbidity and mortality.

The WHO Expert Committee on Prevention of Cancer stated in its report¹ that the majority of human cancers appeared to be potentially preventable. The control of carcinogens plays an essential role in primary prevention. At the present stage, however, early detection and prompt and adequate treatment of precancerous and cancerous conditions are of major public health importance.

The present report considers the principles and practice of early cancer detection from an international standpoint.

2. GENERAL CONSIDERATIONS

The objective of early disease detection, diagnosis and treatment (sometimes called secondary prevention) is to discover and cure conditions that may already have produced pathological changes, even though the patient is generally asymptomatic and apparently healthy. This is in

¹ *Wld Hlth Org. techn. Rep. Ser.*, 1964, No. 276.

contrast to primary prevention, the aim of which is to protect the individual and/or the population from exposure to disease by such means as vaccination or removal of the exciting agent (e.g., in lung cancer, cessation of cigarette smoking).

2.1 Rationale of cancer detection

Belief in the value of programmes for the early detection of cancer is based on the following assumptions:

(1) In many instances microscopically and clinically malignant disease is preceded for a period of months or years by a pre-malignant lesion, removal of which prevents the subsequent development of cancer.

(2) Most cancers begin as localized lesions, either at the pre-invasive or early invasive stage. If found at this stage, a high rate of cure is obtainable.

(3) In many countries as much as 75 % of all cancers occur in body sites that are readily accessible and for which reliable cancer detection techniques are available.

(4) Present methods of treatment, although not ideal, are often very effective if applied early enough.

(5) In most cancer sites and in most cancer cases a relationship between early diagnosis and good prognosis can be demonstrated.

In the light of present knowledge it is generally accepted that, in most instances, programmes emphasizing the detection and diagnosis of early cancer and its precursors provide the best possible protection for the individual and the community.

2.2 Definitions

Since such terms as early detection, screening, and case-finding have different meanings in different countries and even, in many instances, different meanings in the same country, the Committee adopted the following definitions for use in this report.

Early detection

Early detection covers all measures aimed at identifying suspect cases within a given population at a time when the cancers are sufficiently localized to be amenable to standard therapy. It should be stressed that the techniques used in early detection do not of themselves enable a firm diagnosis to be made; detailed complementary examinations are needed for this purpose.

Screening

In the USA, the Commission on Chronic Illness has defined screening as "the presumptive identification of unrecognized disease or defect by the application of tests, examinations, or other procedures which can be applied rapidly. Screening tests sort out apparently well persons who probably have a disease from those who probably do not. A screening test is not intended to be diagnostic."¹ As Wilson & Jungner² have noted, this definition covers the identification of unrecognized symptomatic as well as pre-symptomatic disease and physical examination is considered as part of the screening procedure so long as it can be classed as rapid. "Other procedures" may include the use of questionnaires, which are assuming an increasingly important place in screening. Finally, the tests used may be "diagnostic", though this is not their primary purpose; for example, a gynaecological examination could be covered by this definition provided it were rapidly carried out.

Mass screening

This term is used to indicate screening of large population groups.

Selective screening

This term is used for the screening of selected high-risk groups in the population. It may still be large scale, and may be considered as one form of population screening.

Multiple (or multiphasic) screening

Multiple screening has been defined as "the application of two or more screening tests in combination to large groups of people".³ Multiple screening should not be confused with "multi-step screening" where the same individual is screened for the same disease by two or more persons at different professional levels.

Case-finding

This term is applied to that form of screening in which the main object is to detect disease and bring patients to treatment, in contrast to epidemiological surveys.

¹ Commission on Chronic Illness (1951) *Proceedings of the conference on preventive aspects of chronic disease, March 12-14, 1951*, Baltimore.

² Wilson, J. M. G. & Jungner, G. (1968) *Principles and practice of screening for disease*, Geneva (*Publ. Hlth Pap.*, No. 34).

³ Commission on Chronic Illness (1957) *Chronic illness in the United States*. Vol. I: *Prevention of chronic illness*, Cambridge, Mass., Harvard University Press, p. 47.

Population or epidemiological surveys

Surveys whose principal aim is to determine the prevalence, incidence and natural history of a disease under study, though case-finding is a natural by-product of such surveys. Screening tests may also be used in population surveys (e.g., sphygmomanometry for blood-pressure determination or tonometry for measuring intra-ocular tension).

3. SCREENING TESTS

Screening tests for cancer can be divided into two groups : (1) general screening tests that indicate the presence of cancer somewhere in the body; and (2) site-specific tests that indicate the presence of cancer in a specific organ or site.

The advantages of a relatively simple and reliable general screening test for cancer are self-evident. Numerous tests have been proposed that would utilize the cancer patient's blood, urine, body secretions or immunologic or enzyme systems. To date all such tests have proved unsatisfactory.

However, while no general screening tests for cancer are available, there are a number of different procedures for detecting precancerous and cancerous conditions. Some of these are still in the experimental stage (or need further evaluation), but many screening techniques have already proved their applicability to the detection of cancer in various body sites.

For a cancer screening test to be considered ideal, whether general or site-specific, it should possess the following characteristics:¹

(1) *Simplicity.* The test should be simple so that it can be carried out easily and quickly and with a minimum of discomfort to the patient. Also, it should be suitable for screening large numbers of patients.

(2) *Sensitivity.* The percentage of false negatives must be low; furthermore, the test must be capable of detecting disease in its early stages.

(3) *Reliability.* The percentage of false positives must also be low.

(4) *Productivity.* The test must have a high productivity, i.e., the frequency of the cancer to which it is applicable must be sufficiently high to ensure a useful yield, assuming the test is sensitive and reliable.

(5) *Low cost.* The equipment required should be inexpensive and the test should make minimum demands on personnel time.

¹ See, for example, O' Donnell, W. E., Day, E. & Venet, L. (1962) *Early detection and diagnosis of cancer*, Saint Louis, Mosby.

These criteria are, of course, interdependent. In assessing the value of a cancer screening test, one must consider the number of criteria that it satisfies and to what degree.

3.1 Techniques and methods for screening

Clinical examination

One of the most important screening methods is a rapid clinical examination of the patient. This may cover one or more body sites but is not necessarily a complete physical examination.

Exfoliative cytology

Exfoliative cytology is the study of cells shed from a surface, such as the bronchial, gastric or uterine mucosa, into the secretions. The identification of malignant cells in these secretions permits the detection of precancerous or cancerous lesions in these sites. This technique has developed very rapidly and is one of the most important of the techniques available for early cancer detection.

X-ray techniques

There are a number of screening techniques that utilize various types of X-ray examination. Several of these are site-specific and are discussed below with reference to the appropriate body site.

Thermography

Fever, as measured by the clinical thermometer, has long been known to signify illness but the significance of skin temperature elevations has received scant attention. Recently, however, the highly sensitive infra-red detection devices that have been developed for industrial use and for space programmes have also been finding applications in the health field. One of the most significant of these is the use of thermography machines to detect minute amounts of heat generated in and around multiplying cancer cells by the increased blood supply.

Endoscopy

A number of potential cancer sites can be examined by different forms of this technique, e.g., by bronchoscopy, colposcopy, gastroscopy and proctosigmoidoscopy. These site-specific techniques are discussed below with reference to the appropriate body sites.

Other techniques

Recently, immunological techniques for detection of primary liver cancer have been developed. These are based on the production of embry-

onic globulins by liver cancer cells and have a very high sensitivity. They are now undergoing large-scale evaluation in countries where primary liver cancer is very frequent. Metastatic liver cancers do not give positive findings in this test.

Screening for carcinoma of the stomach by intragastric photography must still be regarded as in the experimental stage. This technique might suitably be studied in those countries with special high risk groups.

Self-examination by the population being screened may be useful in some forms of cancer. The applicability of self-inspection and self-palpation to the various body sites will be discussed in section 3.2 under the appropriate sites.

3.2 Applicability of techniques

The body sites considered below are common cancer sites that lend themselves to one or more screening technique or methods. It should be noted that the order in which the sites are considered does not reflect their relative importance.

As noted in the previous section, one of the most important methods for detecting cancer is a good clinical examination. Since this examination in some form or another might be made for most of the body sites considered, it is not given special mention under the various headings.

3.2.1 Female genital organs

There is considerable evidence that the early detection of cervical cancer improves the survival rate. While there is every reason to suppose that diagnosis and treatment at the stage of in situ carcinoma of the cervix would further improve the survival rate, sufficient data in support of this assumption have not yet been accumulated.

From studies of the natural history of pre-invasive cervical cancer there is good evidence that in situ lesions of the cervix may ultimately become invasive cancer.¹ Estimates of the proportion of in situ lesions that will ultimately become invasive vary from as low as one quarter to as high as two thirds. Furthermore, in a study carried out by Fidler et al.² in British Columbia it has been observed that the introduction of widespread screening by exfoliative cytology has been followed by a decrease in the incidence of invasive cervical cancer. Similar findings have been reported by other investigators. Nevertheless, there is not yet sufficient evidence to be certain that the reductions in incidence can be attributed to the screening programme.

¹ Richart, R. M. (1967) *Clin. Obstet. Gynec.*, **10**, No. 4, p. 748.

² Fidler, H. K., Boyes, D. A. & Worth, A. J. (1968) *Screening for malignant disease by means of exfoliative cytology*. In: Sharp, C. L. E. H. & Keen, H., ed., *Presymptomatic detection and early diagnosis—a critical appraisal*, London, Pitman, p. 313.

(a) *Exfoliative cytology*

Studies carried out by Boyes et al.¹ indicate that it takes from 10 to 13 years for a pre-malignant or an in situ lesion of the cervix uteri to become clinically recognizable invasive carcinoma. From a screening point of view, however, the important consideration is the minimum time required for the development of in situ carcinoma in a cytologically normal cervix. Further work is needed to settle this question, the answer to which must determine the optimum frequency of cervical cytological examinations. On the basis of the data at present available, it is recommended that such examinations be performed at least every one or two years. This is a complex subject and further research may indicate the advisability of using different time intervals for different age groups.

Cervical cytology should be considered as one aspect of an integrated programme of uterine cancer control. This pre-supposes adequate facilities for definitive diagnosis, appropriate treatment, follow-up, rehabilitation and evaluation. An important part of evaluation is correlation of the cytological and histological findings in all those cases detected as positive by cytology. The choice of the methods for collecting specimens for cervical cytology is of paramount importance. Data available show that depending on the method used, the false negative rates vary from 2% to 50%.²

In one relatively new technique that has been rather widely used in several countries specimens are obtained by means of the irrigation cytopipette.³ This is a plastic pipette, which is filled with a fixative solution and inserted by the woman into the vagina. The contents of the pipette are expelled and then sucked back into the pipette. In a study in Maryland, USA, Davis & Jones⁴ obtained an approximately 80% acceptance rate for this technique. While it is not suggested that this technique should replace routine examination and cervical smear, it may be of value in special circumstances.

The use of various automated devices for improving the speed of examining cytological specimens is at present under study but has so far proved disappointing.

(b) *Colposcopy*

Colposcopic examination of the cervix may be included as a complementary technique in mass screening programmes. As a screening procedure it must, however, be regarded as less efficient than accurate cytological examinations and its use as a routine technique in mass screening is

¹ Boyes, D. A., Fidler, H. K. & Lock, D. R. (1962) *Brit. med. J.*, **1**, 203.

² Richart, R. M. & Vaillant, H. W. (1965) *Cancer*, **18**, 147.

³ Davis, H. J. (1962) *Amer. J. Obstet. Gynec.*, **84**, 1017.

⁴ Davis, H. J. & Jones, H. W. jr (1966) *Amer. J. Obstet. Gynec.*, **96**, 605.

not recommended. Colposcopic examinations are, however, considered of great value as a complementary procedure in suspected cases.

(c) *Schiller's iodine test*

Schiller's iodine test is based on the reduced glycogen content of the abnormal epithelial cells and is not considered specific enough for cancer to be useful in mass screening programmes. Some investigators have found it of value in determining abnormal areas and in selecting the place from which to take a specimen for biopsy.

3.2.2 *Breast*

In a large number of countries today breast cancer is one of the most frequent forms of cancer among women. Unfortunately, all too often a malignant tumour is not detected until it has reached substantial proportions.

The importance of screening examinations is that they provide a means of detecting lesions that might otherwise be overlooked. In the absence of suitable techniques for the detection of pre-malignant lesions, the object of screening programmes for breast cancer is the detection of small, early tumours. The screening techniques employed include physical examination, examination by the woman herself, and examination by such special techniques as mammography or thermography.

(a) *Physical examination and self-examination of the breast*

It is important for the physician to be aware of the need to make a careful examination of the breasts. At the same time, he should teach the woman the technique of self-examination, so that early lesions are not ignored. It should be kept in mind that instruction in this technique is only a part of health education; the woman should be advised to repeat the examination at least monthly and to report promptly to her physician any abnormality noted.

(b) *X-ray mammography*

Soft tissue roentgenography of the breast has been developed as a diagnostic adjunct for the detection of early breast cancer. The use of this technique often helps the physician to detect breast cancer at an earlier stage than would be possible by clinical evaluation alone.

In some countries, X-ray mammography is being used extensively in screening programmes. In other countries, however, its use is still uncommon. There are a number of reasons for this, including insufficient numbers of radiologists and radiological technicians trained to use the technique and the relatively high cost of providing the necessary training

and facilities. Moreover, there are indications that several new screening techniques at present being developed may come closer to fulfilling the criteria discussed earlier in this report. For the present, it would seem that conventional X-ray mammography should be used only as an adjunct to diagnosis.

(c) *Xeroradiography*

This is another radiographic procedure sometimes used to examine breast structure, the X-ray image being obtained on a selenium-coated plate instead of on photographic film. The plate is subjected to an electric charge before making the X-ray exposure. When the plate is exposed to X-rays, the reduction in the charge at any point is proportional to the intensity of the radiation received. The plate is developed in a cloud of oppositely-charged powder in a light-proof box. The need for several steps has been considered a drawback in the past, but new equipment to overcome this problem is currently being developed.

Among the advantages of xerography over conventional mammography are (1) better definition of detail on the xerogram than on the X-ray film; (2) reduced exposure to radiation (approximately one-half); and (3) all the breast structures are delineated on a single xerogram, which is not possible on a single mammogram. Although xerography can not yet be considered a routine screening procedure, further refinement may well make it so in the near future.

(d) *Thermography*

Thermography is another technique that is being evaluated for mass screening of breast cancer. It is essentially a form of infrared photography used to detect localized temperature elevations that occur in cancers of the breast because the blood flow is greater than that in the surrounding tissue. Thermal patterns can be recorded on film and permit the detection of localized cancer in asymptomatic women. Some studies evaluating this technique have shown up to 94 % accuracy.

Thermography has the great advantage that it avoids unnecessary radiation to both patients and staff. It may therefore prove useful as a preliminary screening procedure, which will permit X-ray mammography to be confined to those women already shown to have an abnormal thermographic pattern.

(e) *Ultrasonics*

The use of ultrasonics for detection of breast cancers is also being explored, although the technique has not yet reached the stage of practical application.

3.2.3 Lung

In many countries accurate mortality data for lung cancer are not available, so that the magnitude of the problem is difficult to assess.

In the USA, the statistics indicate that approximately 65 000 new cases will occur in 1968 and approximately 59 000 deaths will result. It is further noted that the death rates are continually increasing, having risen from 18.4 deaths per 100 000 persons in the period 1949-51 to 39.1 per 100 000 for the period 1964-66, an increase of 113 %. Statistics for incidence and mortality from a number of other countries also show a similar trend. At the stage in which lung cancer is usually diagnosed the prognosis is bad and overall survival rates reported from several countries are 5-10 % at the most.

(a) Chest X-ray

In some countries, mass radiography has been used for a number of years for the detection and diagnosis of tuberculosis. Attempts have been made to use the same technique for the early detection of lung cancer, but the results have been relatively poor and very little, if any, improvement in the prognosis has been achieved. This has been demonstrated in several large-scale surveys in the United Kingdom and the USA.¹

(b) Exfoliative cytology

Both sputum and bronchial washings have been utilized for detecting early lung cancer. There are a number of reasons why exfoliative cytology cannot at present be recommended as a routine procedure for the detection of early lung cancer. First, the patient may be unable to produce adequate samples of sputum and the bronchus is not readily accessible for obtaining bronchial washings. Second, the examination of sputum is more time-consuming and costly than the examination of cytological specimens from other areas of the body. Finally, even when a sputum has been found to be positive, it is frequently impossible to identify the site of the lesion early enough to improve the prognosis. For these reasons, therefore, the use of exfoliative cytology cannot be recommended for mass screening for lung cancer.

From the above it may be concluded that, at the present time, the only rational approach to reducing the morbidity and mortality from lung cancer is to concentrate on prevention rather than early detection, particularly in view of the many studies that have demonstrated a causal relationship between cigarette smoking and lung cancer.

¹ For further details see: Boucot, K. R., Cooper, D. A. & Weiss, W. (1961) *Ann. intern. Med.*, **54**, 363; Cuthbert, J. (1959) *Brit. J. tuberc.* **53**, 217; Gifford, J. H. & Waddington, J. K. B. (1957) *Brit. med. J.*, **1**, 723; Posner, E., McDowell, L. A. & Cross, K. W. (1959) *Brit. med. J.*, **1**, 1213; and Waddington, J. K. B. (1960) *Med. Offr.*, **104**, 293.

3.2.4 *Colon-rectum*

Together with the uterine cervix, the skin, and the oral cavity, the colon-rectum offers an excellent opportunity for detection, early diagnosis and even actual cancer prevention. Not only is this area one of the most common sites of cancer, but it is also readily accessible to digital and visual examination — detection techniques that are available to the general practitioner. In addition, cancer of the colon-rectum is thought to be preceded in many instances by a readily identifiable pre-malignant lesion that is susceptible to removal months or years before it undergoes malignant changes. Thus, in colon-rectum cancer, early diagnosis is not only life-saving, but can also eliminate the need for extensive surgery and unpleasant prostheses. Yet, even though several detection methods for early diagnosis of this disease are available, the yearly colon-rectum cancer deaths total approximately 45 000 in the USA alone.

(a) *Endoscopy*

Of the several methods of early detection of colon-rectum cancer that have been evaluated, the Committee felt that the best procedure is a clinical examination including a digital examination of the rectum and palpation of the abdomen. This may be followed, where indicated, by proctosigmoidoscopy. While there is no doubt that routine proctosigmoidoscopy can be a most effective cancer detection technique, it is quite obvious that in those countries where the incidence rate is very low it should not be considered as a screening device.

Routine sigmoidoscopy using the conventional rigid sigmoidoscope is a well-known procedure. It should be noted, however, that several new instruments are available and others are in the final testing stage. These will improve even further the ability of the proctosigmoidoscopic examination to detect colon-rectum cancer early. One new instrument that is currently being evaluated by the Cancer Control Programme of the US Public Health Service is a flexible "fibre-optic" sigmoidoscope which will enable the examiner to pass the sigmoidoscope for a distance of approximately 45 centimeters instead of the usual 26 centimetres. This instrument has flexible glass fibres for conducting the light, in place of the normal light source, and it also contains channels for air and water. Flexible plastic fibres, which are much more durable, are being developed to replace the glass fibres. It should also be noted that whereas the rigid sigmoidoscope at present in use enables approximately 45 % of existing lesions to be detected, with the new flexible instrument approximately 80 % can be seen.

(b) *Cytological examination*

Since there are several methods of collecting cells and the technique of exfoliative cytology has been described earlier, no detailed description

will be given here. It should be noted that in the hands of a highly skilled, interested and enthusiastic team cytological examination has given some very encouraging results. However, the technique has presented problems to less experienced workers, who have found it difficult to duplicate the results.

According to Fidler et al.,¹ although cytological investigation is useful in the individual symptomatic patient, its application as a screening method in the general population does not seem justified. It would, however, be worth considering its systematic application in high-risk groups, such as patients with long-standing ulcerative colitis or polyposis.

(c) *Chemical tests*

Several other tests have been suggested as possible screening devices. One of these is the *guaiac test*, which is used to detect occult blood in the stools. Because this test is not specific and because the patient generally has to be kept on a meat-free diet beforehand, it is not very useful as a routine screening procedure. A new version of this test, now being studied in the USA, eliminates the need for a meat-free diet and has been so devised that a positive result may generally be considered a definite indication of the need for a further examination. In other words, the new version has a higher degree of specificity for colon-rectum cancer than the earlier guaiac tests.

3.2.5 *Stomach*

The stomach is not readily accessible and diagnosis by normal clinical means is usually established late in the course of the disease. The death rate reported by most workers is exceedingly high, in spite of apparently successful resection. Exfoliative cytology has not proved very rewarding and is not an easy procedure. Nevertheless, it is an acceptable adjunct to other methods.

In recent years, the value of gastroscopy has been greatly increased by the development of fibre-optic gastric photography. This technique is being extensively employed as a screening procedure in high-risk groups (particularly elderly men) in Japan, where the incidence of gastric cancer is notoriously high. It remains to be seen, however, whether the considerable effort that this programme involves will be rewarded by a demonstrable fall in national mortality figures. Other methods of screening, such as exchange-resin tests for free hydrochloric acid, and selection of anaemic patients for special study, have not proved efficacious. Tests for gastric parietal cell antibodies are attracting attention at the present time and may yet prove of value as a screening technique.

¹ Fidler, H. K., Boyes, D. A. & Worth, A. J. (1968) *Screening for malignant disease by means of exfoliative cytology*. In: Sharp, C. L. E. H. & Keen, H., ed., *Presymptomatic detection and early diagnosis—a critical appraisal*, London, Pitman, p. 327.

3.2.6 *Bladder*

Population screening by regular cytological examination of the urine has an important place in the detection of early cancer of the bladder. Such examinations are especially to be recommended in selected high-risk groups, such as men employed in the aniline dye industry and exposed to certain aromatic amines and azo compounds. Precancerous papillomas and early malignant lesions can be detected by this means. It is essential, however, that the urine examinations should be made regularly and this involves carefully planned programmes. One difficulty encountered in practice is that some men, after having been exposed for a number of years, leave the industry and can no longer be traced.

3.2.7 *Mouth*

Many malignant or potentially malignant lesions within the oral cavity are open to inspection and palpation. In doubtful cases, cytological examination of scrapings from these lesions may sometimes make it possible to establish a firm diagnosis.

3.2.8 *Oesophagus*

In areas where the prevalence of oesophageal cancer is high, the use of exfoliative cytology as a screening procedure is under study.

3.2.9 *Skin*

In certain countries cancer of the skin is very common but is often not diagnosed until it has reached an advanced stage. A screening programme for early detection might well be established as part of a public health programme in such countries.

4. ORGANIZATION OF EARLY DETECTION PROGRAMMES

During the last decade programmes for screening whole populations or population groups for cancer and pre-cancerous lesions have been organized in many countries. The problems involved in the organization of such programmes were examined at the Seminar on the Early Detection of Cancer convened by the WHO Regional Office for Europe in Oslo in 1965.¹ They have also been discussed by Gonzalez,² Wilson & Jungner,³ and several WHO expert groups.⁴

¹ The report of this meeting is obtainable on application from the Regional Office for Europe of the World Health Organization, Copenhagen.

² Gonzalez, C. L. (1965) *Mass campaigns and general health services*, Geneva, WHO (*Publ. Hlth Pap.*, No. 29).

³ Wilson J. M. G. & Jungner, G. (1968) *Principles and practice of screening for disease*, Geneva, WHO (*Publ. Hlth Pap.*, No. 34).

⁴ See, for example, *Wld Hlth Org. techn. Rep. Ser.*, 1960, No. 193; 1963, No. 251; 1964, No. 276; and 1965, No. 294.

Although the organizational structure and scope of cancer detection programmes differ in different countries, the following broad groups may be distinguished:

- (1) early detection services integrated with public health services;
- (2) special detection programmes covering fairly large selected populations;
- (3) detection programmes limited to the screening of certain hospital or other patients;
- (4) examinations for cancer and pre-cancerous lesions as part of a multiple (complex) screening programme, which may be restricted to certain population groups, such as industrial workers, or may be part of a large generalized multiple screening programme;
- (5) screening programmes directed towards selected groups of the population, for example, programmes for the detection of gynaecological cancer or for the detection of cancer of the lung, bladder, etc. in high-risk groups in various industries;
- (6) individual general preventive examinations of all body sites for cancer and pre-cancerous lesions in persons of appropriate age who visit a general practitioner or a "cancer detection centre".

It should be noted that this list of types of detection programme is not intended to be comprehensive and that some countries may utilize only one type of programme while others may utilize several types.

In clinics and hospitals, individual preventive examinations are generally performed by specialists, whereas in screening centres examinations are often performed by experienced, specially trained midwives or other paramedical personnel, who refer suspected cases to a specialist.

In some countries, relatively large selected population groups are screened through organized programmes aimed at detecting cancer of specific sites. Many of these programmes are organized and financed mainly by voluntary health organizations or cancer institutes, receiving little financial assistance from the public health services. There are also countries in which detection of early cancer is still limited to the examination of persons attending special hospitals for in-patient or out-patient treatment services and to examinations performed by physicians in the course of their routine work.

In some screening programmes, the examinations are made in special centres, while in others mobile teams of doctors and auxiliary personnel visit the communities being covered.

While special-purpose mass screening of selected populations is probably one of the most efficient methods for early cancer detection at present in use, careful consideration should be given to the possibility of

organizing multiple (complex) screening programmes and to the inclusion of cancer tests as a routine in other medical programmes, e.g., the inclusion of cervical cytology in maternal and child health activities.

4.1 Relationship to the general health services

In some countries early detection of cancer is already part of the programme of the general health services. These services have the responsibility for planning, implementation and evaluation of the programme. The cancer detection programmes are a permanent feature of the health services and aim at examining all the population at risk.

In many other countries, however, early cancer detection campaigns will, like mass campaigns against communicable diseases, have a definite beginning and an anticipated end-point. The execution of such programmes will be greatly facilitated by a close contact and co-operation, at all levels, with the general health services. Contact at the central level should be established by including in the central planning body of the cancer detection programme representatives of the health services. This will ensure that the programme is integrated into the general health programmes of the country and will make it possible for cancer detection programmes to be established on a more permanent basis.

An illustration of the need for co-operation at the top level with the health services is provided by the difficulties encountered in screening programmes based on cytological examinations. In most countries, the main factors limiting a more widespread use of this method are the scarcity of cytological laboratories and the lack of trained personnel. This problem can be solved only by the support of the general health services.

Cancer detection programmes, apart from their primary purpose of detecting cancer, can contribute in a number of ways to the general health services. They call for intensive campaigns of health education, both among the general public and among the medical profession; they arouse interest in health problems and, in many countries, have contributed to improved registration of cancer and a better follow-up. Mass cancer campaigns provide opportunities for operational research on the most effective organization and lowest possible costs. In general, the attempt is made in such campaigns to use a minimum of doctors and to rely as much as possible on paramedical and auxiliary personnel.

Co-operation with the health service at the intermediate level (district, county) will facilitate the implementation of a cancer detection programme. The medical officer of health will have at his disposal the organization of the health service and will know what medical facilities are available for diagnosis and treatment. Also the endorsement of a cancer detection

programme by the official health services is likely to ensure a better acceptance of the programme by the population.

Screening programmes organized at the local level without the support of the general health services tend to be of little value as often only a single screening examination is performed, without adequate follow-up and possibilities for evaluation.

In summary, a close co-operation between the bodies organizing cancer screening programmes and the general health services is mutually beneficial. The work of the cancer detection programme should be integrated with that of the health services as early and as fully as possible. The ultimate aim should be to make cancer prevention as important a part of the programme of the health services as other activities in preventive and curative medicine.

4.2 Need for a central planning body

The Committee endorsed the view of the WHO Expert Committee on Cancer Control¹ that every cancer control programme should have a central planning body whose responsibility is "to establish policy, set standards, implement operations, co-ordinate work in all fields of cancer control and integrate cancer control measures with the work of other health services and voluntary agencies. This central body will usually be established in a national, district or local administrative area."

The central planning body should include experts in all aspects of cancer control, e.g., physicians (especially those trained in clinical oncology), health administrators, epidemiologists, and other professional and lay personnel with appropriate skills and experience, depending on the content of the programme.

The organization of the programme should be vested in a competent staff and planning should cover all control measures necessary for the type of programme being developed. Periodically, the programme should be reviewed by the central planning body to ensure that the policy laid down is being adhered to and is giving satisfactory results. It is vital for the planning body to be aware of advances in cancer control and to be quick in adjusting its operating policies as necessary.

4.3 Choice of programme

The type of programme required will depend on a number of factors such as : population distribution; geographic factors; population density; type of government; and availability of funds, medical and paramedical personnel, and appropriate equipment.

¹ *Wld Hlth Org. techn. Rep. Ser.*, 1963, No. 251, p. 15.

The incidence and prevalence of cancer will obviously be important factors in determining the choice of programme. For instance, screening for oral carcinoma would be justified in certain countries, such as India, where this form of cancer occurs frequently, while such screening would not be warranted in countries where this disease is rare. The choice of screening programme will also be strongly influenced by the availability of suitable detection procedures.

The identification of high-risk groups is another important factor in determining the type of programme to be chosen.

In recent years, epidemiological research has identified high-risk groups for various types of cancer. In some industries, for example, there is a high risk of a particular type of cancer, such as cancer of the urinary bladder or the lung. It is also known that heavy cigarette smokers constitute a special high-risk group for lung cancer. The incidence of many cancer types is clearly related to age and sex. Thus, lung cancer has its highest frequency in the age-group 50-60. Gastric cancer occurs largely in groups over the age of 50, and mammary cancer is also most frequent in the higher age-groups. Several investigations of cervical cancer have indicated that precancerous changes are most frequent in the age-group 35-45, whereas the incidence of invasive carcinoma is highest between 40 and 64 years of age. In this connexion, it may be mentioned that the country-wide plan for screening of cervical carcinoma in women in Sweden will be limited to women aged between 35 and 50. Although this means that only about 40 % of the women will be screened, it is expected that a 70 % coverage of precancerous lesions and invasive cancers will be achieved.

Married women have a higher incidence of uterine cervical cancer than unmarried women. This is particularly true for those who married early, and it is generally believed that early sexual activity is an etiological factor. It has been found also that cervical cancer is strongly related to race and socio-economic background, and that there are marked geographical and cultural differences.¹ It is well-known that Jewish women have a very low incidence of cervical cancer. On the other hand, investigations in the USA have shown that certain poor negro populations, as well as women from Puerto Rico, Mexico and Latin-American countries, represent high-risk groups for cervical cancer, in terms of both in situ and invasive lesions, with an incidence up to 39 per 1000 examined. Screening programmes must provide for the examination of these higher-risk groups, if at all possible.

It has been found in many screening programmes for cervical cancer that a substantial proportion of the women (usually about 20 %) fail to participate in spite of intensive propaganda and educational efforts. These

¹ Aitken-Swan, J. & Baird, D. (1966) *Brit. J. Cancer*, 20, 624.

women seem to belong largely to the lower socio-economic classes, among whom the incidence of cervical cancer is relatively high. They tend to be less health conscious and consequently their carcinomas are usually diagnosed at a late stage, a fact that tends to maintain the mortality rate within the population at a high level. Special efforts should therefore be made to reach this group. One possibility that has been considered is to make routine cytological examinations of cervical smears in adult women admitted to hospitals, as well as in women participating in antenatal care programmes.

4.4 Acceptability to the public

An absolute requirement for the successful implementation of a screening programme is that it should be acceptable to the population. Suitable education is therefore an important part of all such programmes, and must take into consideration the social, cultural and religious conditions.

The problems will differ widely in different countries. In modern industrial societies, the interest of the population in the programme can be aroused through the press, radio and television. Moreover, the population can be mobilized by personal calls, through letters, or through voluntary organizations. In some countries, this work is facilitated by the existence of official registries from which personal data, such as name, address, age and sex, may be obtained. Special forms should be prepared to record both the personal data and the results of the medical examination.

In developing countries, the problem may be more complicated. Here collaboration should be sought with already established organizations, particularly those for mass campaigns against other diseases, such as the malaria eradication programme. It may be necessary to organize a special staff of home visitors, with responsibility for the necessary education, registration and mobilization of the population. Health education of the general public to ensure adequate participation in screening programmes is discussed in section 6.3.

The choice of test method may decisively influence the acceptability of a screening programme. For example, in some countries gynaecological examinations will be accepted only if carried out by female doctors. Experience in many screening programmes for cervical cancer shows that a certain percentage of women refuse to attend for examination. Studies on motivation are therefore greatly needed.

Another important consideration is the selection of a suitable place as an examination centre. Where possible, existing facilities should be utilized, such as special detection centres, out-patient clinics, health units, rural hospitals, mobile units, and school rooms. Sometimes, especially

in developing countries, it may be desirable to re-model an old facility or construct a new building. The layout and necessary equipment should be planned to meet the local needs.

4.5 Acceptability to the medical profession

Acceptability to the medical profession is another absolute requirement for the successful implementation of any screening programme. In many countries, the medical profession has limited understanding of the significance of preventive measures. This attitude is partly a consequence of undue emphasis on curative medicine during medical education. In addition, in most countries doctors are overworked and are bound to devote all their energies to the necessary care of sick people. A contributing factor is that in many countries prophylactic medical care is not covered by the social security system. The Committee considered it important that this situation should be altered. The screening programme must also be acceptable to the health services and should form part of the general health policy of the government concerned.

4.6 Staff requirements

The size of the necessary staff should be estimated, and it may be necessary to conduct pilot studies to establish how many patients a physician and/or allied medical personnel can examine per day. When these items have been determined, an appropriate timetable should be made for the scheduling of the examinations.

It will be necessary to ensure that the participating physicians, one of whom will be the medical officer responsible for the programme, have had adequate training (see section 6.1). In certain countries it will also be necessary to train allied and auxiliary personnel, such as cytotechnicians, home visitors, and midwives (see section 6.2).

4.7 Financing the programme

An estimated budget for the screening programme must be prepared and appropriate arrangements made to ensure that funds will be available for the programme to be carried out as planned.

Increased understanding of the importance of cancer prevention is necessary to ensure adequate financial appropriations from official sources for cancer screening programmes. In many countries, government agencies at present contribute relatively little to this work, which is largely organized and financed by voluntary organizations, whereas the general health services depend on appropriations from official sources. Many developing countries do not have the necessary economic resources to

implement programmes that are highly desirable. Assistance from international bodies will be necessary in these cases.

In making financial provisions in relation to cancer detection programmes, many countries still preserve the distinction between preventive and curative medicine. This is undesirable. The various insurance plans, in those countries where they are available, should give full financial coverage to programmes for the early detection and prevention of cancer, and these programmes should have the same support as programmes aimed at curative medicine.

4.8 Follow-up facilities

The plans for a mass screening programme should provide for follow-up of individuals in whom pre-cancer or cancer lesions are suspected or demonstrated at the time of screening. Adequate facilities should be available for carrying out any further examinations necessary to make a definitive diagnosis, and prompt and adequate treatment of the lesions so detected should be provided.

To permit satisfactory evaluation of the results, re-screening of the population at a later time is necessary. The interval between the examinations must be decided upon and included in the original planning. The interval will differ with different types and sites of cancer. For cervical carcinomas, the length of the optimal interval between examinations is not known with certainty: it may vary from three months to three years.¹ In this connexion, it is interesting to note that in a screening campaign carried out in Norway,² some cervical carcinomas appeared in women who had given negative screening tests only a few months previously. These cases proved to have a very rapid and malignant course.

4.9 Documentation and registration

Adequate documentation and dependable cancer registration are essential to the operation of cancer detection programmes, since this information will assist in defining high-risk groups and will furnish the data necessary for evaluating programmes (see section 5.3).

The necessary registration must be organized in detail. To permit evaluation of the overall results, it is necessary also to secure morbidity and mortality data for that part of the population not covered by the screening programme.

¹ Anderson, W. A. D. & Gunn, S. A. (1967) *CA(N.Y.)*, **17**, 150.

² Norwegian Cancer Society (1959-1965) *Mass screening for cancer of the uterine cervix in Østfold county*, Report, No. 1.

4.10 Operational research

Operational research should be an integral part of the screening programme. The records should permit a continuous evaluation of the cost and the efficiency of the programme. This is necessary not only for the project, but also for future planning.

4.11 Importance of international co-operation

Experience has shown that where a particular form of cancer is prevalent in several neighbouring countries, simultaneous co-ordinated mass campaigns in these countries offer the following advantages: (1) comparative epidemiological studies of the distribution of malignant tumours can be made, providing a clearer picture of possible etiological factors; (2) promotion of closer contacts and better co-operation between investigators in the countries concerned; and (3) economic advantages for countries making joint use of available training facilities, etc.

5. EVALUATION OF EARLY DETECTION PROGRAMMES

The ultimate aim of mass screening programmes is to reduce cancer morbidity and mortality in the community. There is clear evidence from several sources that the incidence of some kinds of cancer has been substantially reduced following well-planned screening programmes. This has been the case, for example, with cancer of the uterine cervix and with certain occupational cancers affecting the skin and the bladder. The impact of screening programmes on mortality rates has proved more difficult to determine. This seems to be due largely to the fact that the screening methods used so far have failed to reach certain high-risk groups, who tend to maintain the mortality rate within the population (see also section 4.3, p. 21-22). On the other hand, it would appear that, at least as far as cervical cytology is concerned, those actually reached by screening methods are in the higher socio-economic and educational groups and would, in any case, have sought early treatment for minimal symptoms arising from early invasive cancer.

Another source of statistical error noted in Canada and in Norway is the tendency to certify all gynaecological cancer deaths as due to cervical cancer, following increased publicity about the screening programme. Moreover, one reason why mortality rates for cervical cancer will be slow

to fall is that a large proportion of the preclinical lesions removed as a result of early detection programmes would not have become clinically manifest for perhaps five to ten years or more.

It is also important to consider the effectiveness of the screening programme not only in terms of the impact on mortality but also in terms of such indirect indices as the effects on the attendance rate, cost per case, stage distribution of cases, and yield. A programme can be considered useful if it leads to a substantial "shift to the left" in the distribution of clinical stages of disease, that is to an increase in the proportion of very early lesions and fewer more advanced lesions. In estimating the cost per case detected, it is clear that, other things being equal, this must depend on the yield of positive cases from the total population screening. There is, nevertheless, a need to examine other aspects of the organization by the application of modern operational research methods.

5.1 The screening test

Interest in screening tests for cancer has increased during the past two decades because of the manifest limitations of routine clinical examination by inspection and palpation. The clinical errors in, for example, palpating tumours of the breast have clearly indicated the need of a procedure with much greater sensitivity. Studies are in progress to determine, for example, whether mammography, thermography and sonography are both sensitive and specific. Many other factors, however, must also be considered, such as availability of equipment and staff, as well as cost and yield.

The most sensitive and specific screening test so far available in the cancer field is exfoliative cytology for the detection of pre-malignant lesions of the uterine cervix. However, the success of cytological screening for cervical cancer depends on a number of factors—how the smear is taken and prepared, how it is transported to the laboratory, and how it is stained, examined and interpreted.

5.2 Public acceptance of mass examination

A screening programme will obviously fail if the public at whom it is directed will not or cannot take advantage of the facilities available. It is, therefore, of considerable importance that attention be given to modern techniques of persuasion and health education (see section 6.3). Experience has shown that in screening programmes that rely on voluntary participation the higher risk groups may be missed (see section 4.3). Another practical problem in programme organization is that the number of persons who present themselves for re-examination is usually consider-

ably below the initial intake. This is a problem that has to be solved if cancer screening programmes are to be fully effective.

The fear has sometimes been expressed that educational projects aimed at increased public participation in cancer screening programmes might create unnecessary anxiety. A number of studies that have been made, however, indicate that this fear is unfounded.

5.3 Follow-up

All patients with pre-malignant, suspicious, or malignant lesions must be closely followed-up. This demands a record system so devised that the names of patients who default in follow-up can be drawn to the attention of the clinician in charge, who will then initiate further action. So far as evaluation of the screening programme in toto is concerned, it is also important to follow up and trace all those people in the relevant population who have either failed to appear for re-examination or have never presented themselves for an initial screening examination. This requires some form of regional or national registration.

5.4 Stage at detection and survival after treatment

It has been suggested that one index of effectiveness of a screening programme is the increase in the proportion of patients in whom cancer is detected at a stage suitable for curative treatment. A good screening programme should detect a tumour either at the pre-invasive stage (e.g., in situ carcinoma of the cervix) or at a very early stage, when it is not yet palpable (e.g., breast cancer). It has been argued, however, that while it might be possible to detect slowly growing tumours at such an early stage, rapidly growing tumours might be already beyond cure by the time the screening examination is done. This applies especially to rapidly growing tumours of the lung and stomach. On the other hand, it seems probable that only a small percentage of cervical cancers fall into this sinister category. Moreover, in the absence of screening programmes, a large proportion of even the slowly growing tumours are detected too late for curative treatment.

There is now no doubt that patients with certain types of cancer can, if appropriately treated, have an expectation of life identical to that of a normal individual of the same sex and age living in the same environment. It is wrong, therefore, to think that cancer is susceptible only to palliative treatment and that the value of early diagnosis is simply to prolong the life of the patient by a few months or years. The truth is that the earlier the diagnosis is made the greater is the likelihood of achieving a definitive cure in the sense defined above.

5.5 Evaluation and research

A cancer detection centre can also make important contributions to the study of the natural history of cancer. In the course of evaluation of the programme, information is obtained as to why certain conditions must be considered precursors of cancer and, in addition, data are obtained on the biochemical and morphological differences between lesions with low and high cancer potential.

The fact that in many cancer detection programmes the same persons are re-examined periodically makes it possible to study the growth potential of different lesions and the rapidity of cancer development in an individual at measured intervals of time. It is also possible to assess the relative sensitivity of detection techniques, particularly in those who appear to have had cancer at the time of a clinically negative examination.

Among so-called "high-risk" groups, cancer detection permits the identification of those factors that characterize such groups and the establishment of criteria for selecting population groups that require the benefit of periodic cancer detection examinations. The relative importance of such factors as age, sex, race, family history and environment in predisposing to cancer or in developing an immunity to it can also be assessed.

6. EDUCATION AND TRAINING

The success of any health programme, and in particular a cancer detection programme, will depend to a large degree on the existence of well-trained, adequately maintained, and well-equipped staff. This is likely, to be even more true in the future, as professional health workers will necessarily have to adapt themselves to changes in organizational trends, health needs, and demands of the population. Two basic changes are worthy of note. While, in the past, many public health programmes depended largely on legal enforcement, the present tendency is to promote disease prevention and detection through educational approaches and a better understanding of sociology by the health personnel concerned. In addition, there is an increasing tendency to develop comprehensive health care programmes through integration of curative and preventive services.

For these reasons, there is a need for appropriate instruction of personnel engaged in cancer detection and prevention and also for adequate training of personnel newly recruited to this field. Furthermore, the training programmes must be continually evaluated to ensure that the quality and quantity of the training provided will produce the qualified personnel necessary for a successful cancer detection programme.

A key factor in the success or failure of a training programme is the teaching staff. Every effort should therefore be made to ensure that the staff is adequately trained and given frequent refresher courses in both technical and educational methods.

It should be noted that the types of training programme and the types of personnel needed will vary from country to country, depending on the kinds of cancer detection programme envisaged. In some instances, training in both general and specialized cancer detection may be required, while in others only one type of programme may be planned. It should also be noted that there are differences in basic educational requirements for training the same kinds of people in different countries, as well as differences in actual programme content and length of training. The content of the training programme should be subjected to periodic revision so that advantage can be taken of new knowledge as soon as it becomes available and training activities that are no longer of value can be discontinued.

6.1 The medical profession

The type of training needed by medical personnel will depend upon previous specialization and experience. The following are some representative examples.

(1) *For general practitioners.* Since the general practitioner is, as a rule, the first physician seen by the patient, he needs to be trained at both undergraduate and postgraduate levels in the newest methods of early detection and diagnosis of premalignant and malignant lesions. He should maintain very close contact with the oncology specialist and with the cancer treatment centre so that he may be aware of the latest developments in early detection, diagnosis and treatment.

(2) *For medical personnel in out-patient services.* The physicians in this group should have had special training in clinical oncology at a more advanced level than the general practitioner. Consequently, they should be familiar with the latest methods of early detection, diagnosis and treatment. In general, the clinical oncologist will play a key role in educating both his medical colleagues and those in allied professions in cancer control and he will also take the main responsibility for the diagnosis and for deciding appropriate treatment of the cancer patient.

(3) *Medical students.* Where possible, medical students should receive training in oncology from the time they enter school until they graduate. The training should include methods of early detection of premalignant and malignant conditions as well as methods for diagnosis and treatment, and should be of a level consistent with the stage reached

by the student in the medical course. The training should be carried out at the medical school or, preferably, in an appropriate cancer hospital. One of the best ways to teach the student is by his actual participation in cancer detection activities; where feasible practical experience might be given to the student in group practice, at a health centre, or in a cancer hospital.

6.2 Allied professions and auxiliary staff

In many countries there is a general shortage of highly trained medical personnel. This has resulted in the utilization, wherever possible, of specialists in allied professions, and of technicians and other auxiliary personnel who have been given special training in the conduct of mass screening examinations. To take cervical cytology as an example, specially trained nurses, practical nurses, or midwives can obtain the smears, which can then be screened by trained cytotechnicians. The provision of training facilities for personnel from allied professions must therefore be regarded as an important part of present and future mass screening programmes.

The following are some representative examples of health personnel who may be used for various cancer detection activities and the training they should be given :

(1) *Public health staff* should be trained in the planning and execution of cancer control programmes, particularly in early detection techniques.

(2) *Dentists* should be taught to look for early cancer of the oral cavity; how to make a good oral examination; and the technique of taking a smear for oral cytological examination, where indicated.

(3) *The home visitor* should be trained in the special needs of cancer patients as they relate to early detection, e.g., assisting in motivation, education and follow-up studies.

(4) *Nurses* should be trained in all phases of early detection of cancer. It should be noted that the role of the nurse and other auxiliary personnel might vary from country to country; it should therefore be clearly identified and appropriate training given.

(5) *Public health nurses and midwives* should also be trained in cancer detection. Such training could include activities that would give them an insight into methods of health education and an opportunity to assist in certain technological procedures for which they can assume responsibility.

(6) *Health education specialists* should be trained in the organization of health education programmes related to cancer control. They should also train other health workers to assist in these programmes.

(7) *Cytotechnologists* should be given special training to enable them to undertake the initial screening of all types of cytological specimens (i.e., cervical, oral, gastric, etc.). The use of such technicians in a screening programme will be of tremendous value in saving the time of the cytopathologists, who, in many countries, are in short supply and heavy demand.

The planning of training programmes for all types of professional personnel in the field of cancer control should be the responsibility of a public health planning body in collaboration with a medical oncologist. Together they should decide the types of training necessary, where it could best be undertaken, and when each programme should be initiated. In addition, the specialized oncologist could, in many instances, direct the training programme at some or all levels.

6.3 Education of the public

Health education of the general public has been acquiring increasing importance during the past two decades. There are still those who question the wisdom and the potential effectiveness of such efforts, and especially so when cancer education is considered. Nevertheless, the Committee shared the views expressed by the WHO Expert Committees on Cancer Control,¹ Prevention of Cancer,² and Cancer Treatment,³ that in order to secure maximum participation in cancer detection activities, it is essential to pursue a sustained and vigorous programme of public education. The main objectives of such a programme are: first, to persuade people to seek prompt medical advice when certain warning signs appear, and, second, to persuade them to take part in screening programmes. The latter is of special importance with high-risk groups. It is clear that simply to provide appropriate facilities for cancer education is no guarantee that the relevant population will take advantage of them. The organizers of such programmes must not only seek all possible methods of communicating with the public, but must examine the cultural and social characteristics of the population concerned and give attention to the deep-rooted fears that so often inhibit what medical men regard as "rational action". The complexity of these inhibiting factors has been fully reviewed by Wakefield & Baric.⁴

It is important also to realize how much education is done almost unintentionally: everything a doctor says to his patient during a consultation is, in fact, a form of education. Nurses, midwives, and, indeed, almost any medical auxiliary workers, are accepted by the public as medical

¹ *Wld Hlth Org. techn. Rep. Ser.*, 1963, No. 251.

² *Wld Hlth Org. techn. Rep. Ser.*, 1964, No. 276.

³ *Wld Hlth Org. techn. Rep. Ser.*, 1966, No. 322.

⁴ Wakefield, J. & Baric, L. (1965) *Brit. J. prev. soc. Med.*, 19, 151.

experts, and if these workers are closely connected with the cancer field they are expected to be well informed on all aspects of malignant disease. Yet their educational impact on the public is usually unconscious, and the question is whether this impact is helpful or otherwise.

One important cause of delay in seeking medical advice, and presumably also in taking advantage of early detection programmes, is a lack of conviction that anything can be done for cancer, even if it is diagnosed. Educational methods designed to inform the public on this basic matter are therefore indispensable to any cancer control programme. In this connexion, it has been shown that women who suspect that they may have cancer tend to delay longer in seeking advice than those who do not suspect the potentially malignant nature of their symptoms. Little improvement can therefore be expected until more people understand that cancer is not one disease, but a family of diseases, some of which are still difficult to diagnose at an early stage or are resistant to present methods of treatment, while others can be detected at an early stage of development and successfully treated, and still others are amenable to modern preventive methods.

It would seem wise to exploit to the full public interest in the feasibility of cancer prevention, which must have a substantial effect on their attitude to cancer in general. The primary aim of all educational programmes must be to emphasize the "hopeful" aspects of cancer. It is worth noting that many physicians are themselves profoundly pessimistic about cancer; regrettably, they are poorly informed about modern therapeutic methods and are insufficiently aware of the vastly better prognosis now enjoyed by patients with many different types of malignant disease. When a pessimistic patient consults an equally pessimistic physician one can hardly expect a rapid and optimistic referral to a treating centre.

6.3.1 *Approaches to educational methods*

At first thought it might seem that cancer education would best be achieved by employing the techniques of mass communication so commonly exploited in the commercial world. It is clear, however, that in the commercial field people are being persuaded to purchase a commodity for which they already have an established need. In the absence of unpleasant symptoms, however, people do not feel the need for cancer education, and the asymptomatic woman, for example, certainly feels no obvious need for a cervical cytology test. Moreover, the commercial advertiser would feel that his campaign had been highly successful from a financial point of view if there had been even a 3% or 4% increase in the sales of his commodity. A response to a cancer detection programme, in developed countries, of less than 50% of the population at risk would be regarded as something of a failure.

The use of mass media can, of course, help to create some change in the general climate of opinion, especially if sustained and prolonged. Nevertheless, there is much experience to suggest that more lasting results arise from education pursued on a person-to-person basis within small groups. This kind of discussion group, which will obviously have to be organized in different ways in different countries, has the special value of allowing frank discussion amongst groups under familiar conditions. Many personal and private questions can be answered and discussed in such groups, and the individuals concerned can be encouraged to discuss their recently acquired information with others. Gradually new groups are formed and further discussion is extended throughout the community. To this end, the organizers of cancer-control and cancer-detection programmes in different regions find it useful to create panels of speakers armed with suitable notes and appropriate audiovisual aids. The latter may take many forms — from simple blackboard drawings and flannel-graphs to professionally made films.

It is clear that every public education programme must be adjusted to local requirements and facilities. There is, however, a great fund of goodwill in every community, and programme organizers can expect the helpful collaboration of newspaper editors, both local and national. Informative articles and commentaries on cancer can be judiciously published at regular intervals for the purpose of getting a screening programme started or directing a constant flow of helpful information to the public. The use of pamphlets, leaflets and posters on the subject of cancer has its place, but some experts in the educational field rightly urge caution in this respect. The publication and wide distribution of pamphlets alone is undoubtedly a very poor substitute for a properly planned educational project. It must again be emphasized that emotive words and pictures have been shown to have an undesirable effect, and tend to inhibit rather than promote medical consultation.

In brief, a public education programme in support of cancer detection should provide helpful information about cancer in general. It should also indicate clearly what facilities for cancer detection and prevention are available in the locality, what the major risks are, and what sections of the population are most at risk.

7. CONCLUSIONS

1. A substantial proportion of cancer patients can be cured by current methods of treatment. It is estimated that the number being cured at present could be doubled if patients could reach a treatment centre earlier than they do, since for most cancer sites survival after treatment is correlated with the extent of the disease at the time of detection.

2. One of the most effective methods of cancer prevention is the early detection and diagnosis of pre-malignant conditions, followed by prompt treatment. This is already technically feasible for several of the most common kinds of cancers.

3. Detection of pre-malignant and early cancer includes all measures, procedures, and techniques that are useful in identifying those persons suspected of having the disease within a presumably asymptomatic, healthy population.

4. Cancer detection can be effected through mass screening programmes or through individual examinations in special or general hospitals, in private offices, factories, etc.

5. Methods available for detection of pre-malignant or early cancer vary according to the anatomical location of the tumour and include clinical examination, radiological procedures, exfoliative cytology, and endoscopy, etc. Perhaps the most promising procedure for mass screening is cervical cytology, partly because this technique is sensitive and reliable but also because it is possible to apply it to the high-risk groups which can be clearly determined within a community.

So far as breast cancer is concerned, several interesting pilot studies are at present in progress. Pilot studies of mammography, xeroradiography and thermography in other countries should also be encouraged. The possibility of using these techniques as screening procedures as well as diagnostic aids should be explored.

The value of organized periodic clinical examinations must also be emphasized. In some countries where cancer of the skin and of the mouth are formidable problems, this kind of screening programme could result in cancer detection at a stage that would allow more effective treatment and save many lives.

6. The organization of detection programmes should be suited to the needs of the country, area and/or local community and take into consideration the prevalence of cancer at specific sites, the availability of reliable detection techniques, materials, and manpower resources, and the socio-economic, educational, and cultural level of the population. The application of epidemiological methods has demonstrated that the frequency of different kinds of cancer differs widely from country to country. Moreover, within each country, different sections of the population have been shown to be at risk in varying degrees. The high-risk groups lend themselves ideally to screening procedures.

7. The programme for detection of pre-malignant and early cancer should undoubtedly be a part of a comprehensive cancer control programme, and facilities for definitive diagnosis and adequate treatment should be available.

8. In planning a detection programme, consideration should be given to the following:

- (i) Integrating the detection programme into the general health services;
- (ii) Selection of high-risk groups;
- (iii) Establishment of laboratory facilities;
- (iv) Utilization and expansion of existing diagnostic and treatment services, where available;
- (v) Training of necessary medical and allied personnel;
- (vi) Financial resources available;
- (vii) Necessary follow-up of pre-malignant, suspicious and diagnosed cases;
- (viii) Continuous evaluation.

9. A successful cancer detection programme depends, to a large degree, on the co-operation of the general public and the medical profession. All countries, whatever their technological and financial level of advancement, will be faced with the need for substantial and sustained health education programmes directed towards both groups. A good health education programme for the general public should be directed towards motivating them to seek examination and gaining their support for all other aspects of the programme. Without this, participation is not likely to be sufficient to make any measurable impact on the cancer problem.

ACKNOWLEDGEMENTS

The Committee acknowledges the special contributions made during its deliberations by Dr V. Demin, Medical Officer, Cancer, WHO; Dr D. Joly, Medical Officer, Cancer, WHO Regional Office for the Americas/Pan American Sanitary Bureau, Washington; and Dr A. Winkler, Medical Officer, Cancer, WHO.

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