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# CANCER CONTROL

## First Report of an Expert Committee

	Page
1. Introduction . . . . .	3
2. General scope of cancer control . . . . .	4
2.1 Prevention . . . . .	5
2.2 Detection . . . . .	6
2.3 Mass screening . . . . .	6
2.4 Diagnosis . . . . .	7
2.5 Treatment . . . . .	8
2.6 After-care . . . . .	9
2.7 Rehabilitation . . . . .	9
2.8 Training of medical and allied personnel . . . . .	10
2.9 Education of the public . . . . .	12
2.10 Mental health of the cancer patient . . . . .	14
2.11 The role of nursing . . . . .	14
3. Organization of cancer control . . . . .	15
3.1 The role of the health services—central planning body . . . . .	15
3.2 Statistics in cancer control . . . . .	16
3.3 Methods of detection and diagnosis . . . . .	20
3.4 Organization of treatment—the team approach . . . . .	23
3.5 Voluntary organizations . . . . .	24
4. Research on different aspects of cancer control . . . . .	25
5. Conclusions . . . . .	26

WORLD HEALTH ORGANIZATION

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## EXPERT COMMITTEE ON CANCER CONTROL

Geneva, 12-17 November 1962

### *Members :*

Professor T. Antoine, Director, I. Universitäts-Frauenklinik, Vienna, Austria

Professeur agrégé P. F. Denoix, Directeur, Institut Gustave-Roussy, Villejuif (Seine), France (*Rapporteur*)

Dr K. Evang, Director-General of Health Services, Sosialdepartementet, Helseidirektoratet, Oslo, Norway

Dr A. Habibi, Professeur agrégé de la Faculté de Médecine de Téhéran, Téhéran, Iran

Dr J. R. Heller, President, Memorial Sloan-Kettering Cancer Center, New York, United States of America (*Chairman*)

Dr K. A. McGarrity, Honorary Director, Cancer Registry of the Royal College of Obstetricians and Gynaecologists, Queen Elizabeth II Research Institute for Mothers and Infants, University of Sydney, Australia (*Rapporteur*)

Professor A. I. Serebrov, Director, Institute of Oncology of the Academy of Medical Sciences of the USSR, Leningrad, Union of Soviet Socialist Republics (*Vice-Chairman*)

### *Representative of the International Union against Cancer :*

Dr R. M. Taylor, Chairman of the Commission on Cancer Control of the International Union against Cancer, Geneva, Switzerland

### *Secretariat :*

Dr A. V. Čaklin, Chief Medical Officer, Cancer, WHO (*Secretary*)

Professor H. de Watteville, Executive Secretary, International Federation of Gynaecology and Obstetrics, Geneva, Switzerland (*Consultant*)

Dr Einar Pedersen, Director, Cancer Registry of Norway, Det Norske Radiumhospital, Oslo, Norway (*Consultant*)

# CANCER CONTROL

## First Report of an Expert Committee

The WHO Expert Committee on Cancer Control met in Geneva from 12 to 17 November 1962, to discuss the different aspects involved in the control of cancer.

The meeting was opened by Dr P. Dorolle, Deputy Director-General of the World Health Organization, who outlined the functions of the Committee and the purposes for which it had been convened. These were primarily to review the problem from an international aspect and, on the basis of results obtained by countries having had experience of cancer control programmes, to define general directives by which countries in different stages of development could evolve effective cancer control programmes.

He also extended a welcome to the Chairman of the Commission on Cancer Control of the International Union against Cancer, Dr R. M. Taylor, who was present on invitation, as representative of the Union.

Dr J. R. Heller was elected Chairman of the Committee and Professor A. I. Serebrov Vice-Chairman; Dr K. A. McGarrity and Professor P. F. Denoix were elected Rapporteurs.

### 1. INTRODUCTION

It is now recognized all over the world that fundamental changes have occurred and are still occurring in the relative role of different groups of diseases as causes of morbidity and mortality. One of the most striking features in mortality statistics at present, apart from the increased number of deaths due to accidents, is that certain chronic, non-contagious diseases, amongst them cancer and diseases of the cardiovascular system, have replaced communicable diseases as the leading causes of death. This trend is most pronounced in countries with a relatively high standard of living and well-developed health services, but may now also be observed in developing countries.

It is, however, not only the increasing role of cancer as a cause of death and invalidism that has stimulated the interest of health authorities as well as the public in the cancer problem. Encouraging progress in knowledge of the etiology of malignant tumours has opened the road to the prevention of certain types of cancer and the results of surgical,

radiological and chemical treatment of the disease have furnished a number of new approaches.

The time when the management of patients with malignant tumours could be left to individual clinicians has long passed. Control of cancer, in the wider sense of the term "control", has in recent years become an integral and important part of the health services of a number of countries. Cancer control consists of a series of measures based on present medical knowledge in the fields of prevention, detection, diagnosis, treatment, after-care, and rehabilitation, aimed at reducing significantly the number of new cases, increasing the number of cures, and reducing the invalidism due to cancer.

In some countries philanthropic organizations have been able to raise funds for the control of cancer which have been utilized with great effect by far-sighted health administrations to increase knowledge of the disease and to improve facilities for the protection of the public. Greatly improved cancer control systems have been developed or are being developed in most parts of the world. Both the public and the health authorities of most countries now expect a plan and an organization for cancer control.

The scientific approach to cancer control has its origin in observations on occupational cancers made some two hundred years ago. The identification and elimination of carcinogens from industry was the first step in effective control and has resulted in legislation in many countries prohibiting or restricting the use of a large number of carcinogenic substances, and leading thereby to the eradication of certain types of cancer. The control of carcinogens continues to play an essential role in primary prevention, but in the cancer problems that are of greatest public health interest today improved methods of secondary prevention play an important part. This latter development has largely been due to improved methods of detection, diagnosis and treatment of cancer and precancerous conditions. Personal habits and customs are now known to be major etiological factors in some cases.

The first steps in a control policy have been developed by legislation introducing cancer services and cancer education. These services extend from control measures in the hands of the specialist to large-scale methods involving the active co-operation of the public.

The time has now arrived for a consideration of the present situation from an international point of view.

## 2. GENERAL SCOPE OF CANCER CONTROL

Cancer control is a very extensive and complex subject the main components of which (described briefly below) the Committee considers to be essential to an effective cancer-control programme.

## 2.1 Prevention

Prevention may be considered as the elimination of, or protection against, factors known or believed to be involved in carcinogenesis, and the treatment of precancerous conditions.

As the causative agents of the various types of malignant tumours are gradually defined, preventive measures are put into effect against them. The greatest results so far have been achieved in the many industries where carcinogenic substances are found, either as raw materials, intermediate products, final products, or by-products, or through being introduced during the production process. A very long list of dangerous substances have thus already been eliminated in industry, or protective measures have been introduced against them. In fact, few industries will prove on close scrutiny to be free of all carcinogens.

In this primary prevention of cancer, attention has also rightly been paid to the increasing number of additives in food, cosmetics and other commodities in general use by the population. Preventive measures against these too have been introduced on a large scale.

The relationship between cigarette-smoking and the rapidly increasing incidence of cancer of the lung is well known. Air pollution has also been incriminated as an etiological factor in cancer.

The health hazards arising from the production, and the medical, industrial and other uses, of ionizing radiation include the potential risk of causing some types of cancer. Several countries have instituted control over these hazards, and the Committee considers such action to be desirable. In particular, attention has been directed to the hazards of undue or excessive exposure to X-radiation in medical diagnosis and treatment. In some countries, it has been found useful to include a health physicist as a member of the staff of large hospitals and other institutions employing sources of ionizing radiation.

Experience from many countries demonstrates beyond doubt that the correct early treatment of precancerous conditions and other lesions that may develop into cancer offers excellent possibilities for prevention. It is therefore essential that the health services be organized and staffed in such a way that early detection and management of such conditions are adequate.

Studies of geographical differences in the distribution of malignant tumours have opened up new roads for the practical application of preventive measures. Generally speaking, however, any step that calls for changes in living habits—food patterns, habits of smoking and chewing, weaning customs, etc.—seems to be taken by people only with the greatest reluctance. Health education of the public, including sufficient information on cancer, therefore constitutes an essential part of preventive efforts.

Changes in eating and drinking habits, it may be noted, offer excellent opportunities for research into the etiology and prevention of cancer.

## 2.2 Detection

The Committee considers that detection covers all measures aimed at isolating suspect cases within a given population. Persons so detected are given detailed complementary examinations to enable a diagnosis to be made. It should be stressed that the techniques envisaged as belonging to detection will not of themselves enable a firm diagnosis to be made.

## 2.3 Mass screening

Screening is a method of detection utilizing tests, examinations or other procedures of rapid application for the presumptive identification of unrecognized disease or defect. The screening of a population group (mass screening) in cancer is a means of detecting precancerous and cancerous conditions.

Before mass screening is undertaken, however, the following points should be taken into consideration.

(1) The general value of such examinations, and in particular their influence on reductions in the number of cancer cases or increase in the survival rate, is still under discussion, and should be carefully assessed through the encouragement of well-planned screening projects. An exception is mass screening for cancer of the uterine cervix by appropriate methods, which has already proved its practical value.

(2) The discovery during systematic examination of benign lesions capable of being treated may constitute a method of cancer prevention.

(3) The scale of the methods needed in mass screening is so large as to make it preferable, as often as possible, to extend the search for pathological conditions to a whole range of diseases, thus converting it into a systematic examination for disease in general.

(4) A number of health education measures must be taken, in order to convince the public, or the groups that are to be examined, of the importance of the examination for the prevention or early diagnosis of malignant tumours. Examinations should be based on persuasion, not compulsion.

It is particularly important that persons with a long-standing history of such conditions as gastritis, stomach ulcers, colitis or cervical lesions should be persuaded to come for repeated examination. Routine periodic examinations are recommended for all population groups over 30 years of age. This age may be modified to suit local conditions.

Routine examination for malignant tumours of patients in hospital, or attending outpatient departments or treatment centres for medical examination by specialists of any kind (individual examinations), likewise helps in the detection of cancer and precancerous conditions in the most frequent sites. This applies also to persons attending prenatal and post-natal clinics, and to the examination of workers with a view to detecting occupational disease.

The preparation and conduct of a mass screening programme requires the following measures :

- (1) a detailed plan that should take the following into account :
  - (a) the population group and the approximate number of people to be studied ; in this connexion, it should be noted that persons of late middle-age living in cities and working mainly in offices are not usually covered in mass screening, while in fact they need screening as much as anybody else ;
  - (b) the place of examination ; this is the place at which people are to attend, e.g., special detection centres, outpatient departments, health units, rural hospitals, etc. ;
  - (c) the medical and allied personnel needed ;
  - (d) the preparation of premises and the installation of adequate equipment ;
  - (e) a work schedule that should be planned to allow examination of the group within a given period of time ;
  - (f) a procedure for sending cases detected by the examination to appropriate centres, and for ensuring that they actually attend ;
  - (g) a realistic evaluation of the cost involved and assurance of the availability of funds to cover it ;
- (2) briefing of the participating doctors ;
- (3) briefing of the allied medical personnel involved.

The effective implementation of such a programme, whatever its scale, necessitates co-ordination through a central planning body or other responsible authority or authorities (see page 15).

#### **2.4 Diagnosis**

The diagnosis of a precancerous lesion is established only by a careful histological examination, and after it has been made certain by appropriate techniques that there is no adjacent malignant lesion.

The diagnosis of a malignant lesion is not always possible at once ; a provisional diagnosis may have to be made in order to start treatment.

A final diagnosis should be established as soon as possible, and preferably at the time of the treatment; for example, by immediate examination or by puncture biopsy. The final diagnosis must be based on a histological examination.

For the statistical evaluation of treatment, the analysis of histologically confirmed and unconfirmed cases should be carried out separately.

Diagnostic reference centres (radiological, histological, cytological) should be promoted in the various countries of the world in connexion with cancer-control programmes.

## 2.5 Treatment

Treatment of cancer should follow diagnosis as soon as possible. It consists of measures that are undertaken for the elimination, arrest or palliation of the disease and that extend the ability of the human organism to resist it. At the present time, surgery and radiotherapy are still the essential therapeutic procedures. For certain types of malignant growth, however, chemotherapy, including the use of hormones, may be beneficial. In many instances, optimal results may be obtained by the combined use of these therapeutic procedures.

Adequate medical treatment will in general diminish the risks involved in surgery and radiation, and may also increase the resistance of the patient to the disease.

In order to obtain the best results, the sequence of the different therapeutic steps must be determined in each individual case according to the site, extension and type of the tumour.

Radical surgical removal of a cancer usually means a major operation, which should be undertaken only by a surgeon who is familiar with the techniques involved, and in a place where special facilities, such as adequate anaesthesia, histopathological and blood transfusion services, and good pre- and post-operative care are available. For the effective radiotherapy of cancer, special technical equipment handled by qualified personnel and directed by a specialist in this field is indispensable.

For various sites of cancer (e.g., of the female genital organs, central nervous system, ear, nose and throat) diagnostic procedures, interstitial radiation, surgical removal of the growth, and supervision of the therapeutic results will be carried out most effectively by physicians specialized in the treatment of diseases of these areas.

In many instances it will be possible to organize the necessary co-operation between specialists of different branches of medicine within a large general hospital. However, the highest standard of treatment may be reached in centres specially devoted to the treatment of cancer. Such a centre could be created if the density of population and facilities for transport of the patients justify it.

## 2.6 After-care

Adequate treatment of cancer patients, perhaps more than of most other patients, necessitates carefully planned and systematic after-care. A well-developed recording and follow-up system is a condition of effective after-care.

A distinction may be made between :

- (1) *prolonged after-treatment*, often radiological, sometimes surgical (e.g., with plastic surgery);
- (2) *medical follow-up* or *after-control*, to establish as early as possible the occurrence of relapses, metastases, new primary tumours, complicating sequelae, etc.;
- (3) *rehabilitation*; and
- (4) *care of those who cannot be rehabilitated.*

The team approach is as necessary in after-care as during the period of primary treatment.

The full utilization of scientific knowledge and applied medical practice in these fields is often neglected, and it may perhaps be stated generally that the primary treatment of cancer is, on the whole, further developed than the various phases of after-care. Again the difficult question of centralization or decentralization arises, because control, after-treatment, and rehabilitation will in many cases call for equipment and personnel not to be found at smaller local medical units. On the other hand, distance will often prevent the patient from travelling back and forth from his home to the place where proper after-treatment can be administered. Special attention should therefore be paid to the necessity for covering transportation costs. Optimal radiological after-treatment will often be possible only at larger cancer centres, although with further development of radiological therapeutic equipment a higher degree of decentralization may be possible.

## 2.7 Rehabilitation

Rehabilitation seems in many cases to represent the weakest link in the present medical organization for cancer control, and more attention should be given to it. Too many patients with cancer now undergo excellent treatment in well-equipped clinical centres or hospitals, only to be left thereafter to themselves—weakened and sometimes partly disabled. Not only is valuable time lost, but from the psychological and social point of view the best period for preparing the patient for rehabilitation is past. When, after some time, the patient, his relatives and his local doctor

realize that rehabilitation is necessary, the task is much more complicated and is sometimes impossible.

It is therefore of vital importance that any treatment centre for cancer, large or small, should be "rehabilitation-minded" from the moment the diagnosis of cancer is established. A preliminary plan for the future life of the patient should be worked out, based on his individual prognosis and taking into consideration psychological as well as somatic factors. In more complicated cases, full rehabilitation in all its medical, educational, psychological and vocational aspects should be undertaken only at a fully specialized rehabilitation centre also handling other types of patients.

Quite a number of patients suffering from cancer cannot be fully cured, or, even if cured, cannot be fully rehabilitated. These patients will need care, in their own homes, in nursing-homes, or elsewhere. To secure proper after-care of such patients, special types of auxiliary personnel, including social workers and home visitors, have been employed. Neither the role of the patient's local doctor nor that of the nurse can be over-estimated in these cases.

Experience in several countries has shown that these patients benefit greatly if social workers, home visitors, etc., have been trained specifically in the problems of cancer patients.

As a general rule, institutions for the care of these cancer patients should not be established as separate entities. Patients suffering from cancer and in need of care should be cared for with chronically ill and aged patients suffering from other diseases.

## **2.8 Training of medical and allied personnel**

The satisfactory control of cancer requires the effective organization of prevention, detection, diagnosis, treatment and after-care by comprehensive teams including clinicians, radiologists, pathologists (including cytopathologists), epidemiologists, statisticians, public health officers, nurses, health education specialists, and other allied medical personnel, whose standard of efficiency should be maintained at the highest level.

(1) *The general practitioner*, who has the first contact with the patient, should be trained at both pre-graduate and postgraduate level in methods of detecting malignant disease. This training can best be provided in hospitals treating cancer and in cancer institutions. It is essential that there should be very close contact between the general practitioner and the treatment centre to bring him into touch with the latest developments in detection, diagnosis and treatment. The general practitioner should be familiar with methods of taking smears from the cervix, skin, sputum and urine for the purpose of cytological examination. He should also

be trained in methods of examining the cervix, the pelvis, and the breast, and the faeces for occult blood. Training in office methods such as Schiller's test and punch biopsies should be included when he practises in remote areas. Since doctors form the principal group concerned in cancer control, methods of health education should form an integral part of their study of cancer.

(2) *Personnel for outpatient service* should be trained in methods of specific detection such as cytology, biopsy, X-radiation, colposcopy and colpomicroscopy.

(3) *Treatment centre staff*, including surgeon, physician, radiotherapist, radiophysicist, and pathologist, should be trained to work as a team. The members of these teams should have facilities for study in other centres. Teams working in treatment centres should be prepared to engage in medical education and to travel to peripheral areas at intervals to conduct teaching campaigns.

(4) The *staff of after-care clinics* should include physiotherapists, occupational workers, home visitors, and medical personnel trained in the management of psychological trauma and rehabilitation.

(5) *Follow-up clinic staff*, including a surgeon, a physician, and a radiotherapist, should be trained to work together as a team, both for the diagnosis of cancer and in the prevention of tumour recurrence.

(6) *Cancer registry staff* should be trained to obtain accurate morbidity and mortality data and to assess epidemiological factors in the field of cancer.

(7) *Research centre personnel* should be trained in lines of research connected with cancer control.

(8) *Public health staff* should be trained in

(a) the planning of cancer control programmes, and

(b) cancer prevention and the elimination of carcinogenic factors.

(9) *Dentists* should be trained in awareness of early evidence of cancer of the oral cavity and in the details of prosthetic requirements following extensive surgery to the jaw, face, and palate.

(10) *Pathologists*, including *cytopathologists*: the training of cytopathologists should be carried out wherever possible in cancer hospitals or cancer institutes. Pathologists should have adequate training in cancer diagnosis. Detailed recommendations on the training of cytopathologists will be found on pages 21 and 22.

(11) *The training of medical students* in the many facets of oncology and cancer control should be carried out in appropriate hospitals and cancer institutes as well as in medical schools. Emphasis should be placed

on training in pre-malignant and malignant conditions, cytological examination, and other methods of early detection.

(12) The training of *the hospital almoner or social worker* should cover the special needs of the cancer patient whether social, educational, economic, or domestic.

(13) *Nurses* should be trained in the treatment of cancer in hospitals or cancer institutes.

(14) *Public health nurses and midwives* should also be trained in the educational aspects of this work.

(15) *Health education specialists* should be trained in the organization of surveys, projects and programmes concerned with the health education aspects of cancer control and the training of health workers in educational methodology.

(16) *Prosthetic technicians* should be trained in the special prosthetic requirements following extensive cancer surgery. This will include surgery of the face, jaw, and oral cavity and extensive amputations at the shoulder joint and hip joint.

A general problem exists as to who should decide on the planning of a programme for training at all levels in the field of cancer. Either a public-health planning authority or a chair of oncology might solve the problem of deciding where and when the training programmes should take place. There may be a particular need for the training of specialized oncologists in every field of cancer to direct the training campaign at all levels.

The Committee considers that the cancer centres developed for diagnosis and treatment should be used for the training of general practitioners, specialists and medical students in cancer control. Medical schools should be encouraged to organize their curriculum in such a way as to keep it constantly abreast of new knowledge in the field of cancer control.

The Committee also considers it desirable that national and international bodies give thought to the provision of fellowships in the various fields of cancer to increase postgraduate training at all levels.

## 2.9 Education of the public

Health education of the population and of patients is an integral part of a cancer control programme and an essential element in the success of most control measures.

Experience in many countries indicates that there is considerable public interest in the subject and widespread readiness to co-operate with the health authorities in the prevention, detection, diagnosis, treatment and

after-care of cancer when the problems involved are properly understood. This has expressed itself in the acceptance of legislation to prevent the use of known carcinogens, in steadily diminishing "delay" in seeking medical advice for cancer symptoms, and in public support for cancer research. Fears lest public education produce neurotic cancerophobia have been found to be groundless, and health services have been able to embark on educational work with confidence provided that high professional standards are observed in its planning and execution.

The technical problems of education, as those of many other aspects of cancer control, are far from simple and require further research, experiment and evaluation. Health education must be founded on a sound basis of fact, which in many respects is still lacking. As education involves making statements about the prognosis of cancer, there is an urgent need for the clarification of such matters as the relationship between early diagnosis, early treatment, and survival rates.

From the standpoint of motivation, some well-recognized reasons for delay in seeking treatment are fear, ignorance, the holding of erroneous beliefs, and the seeking of advice from unqualified persons.

Public opinion surveys have already thrown much light on factors of critical importance in the determination of individual and group behaviour regarding cancer. Their findings should form the basis of all educational planning.

Methods of cancer education must be adapted to the population and may vary considerably according to the cognitive and emotional attitude of people towards cancers of various sites. The long delay between cause and effect in such conditions as lung cancer involves special educational problems that are still far from solution.

Education based on the knowledge available can be carried out by mass information media such as radio, television, newspapers, and magazine articles, and by personal methods, such as individual interviews and small group discussions. The people most concerned in such education are physicians, midwives, nurses, health educators, teachers and ex-patients.

The planning and organization of health education in cancer should be a primary responsibility of the government through the appropriate ministries. Voluntary associations with national coverage, such as cancer societies, and other voluntary health agencies can play a vital role in stimulating, introducing, and testing educational methods. At the local level, cancer education is a function of various public health services such as those connected with maternal and child health, school health, industrial health and geriatrics. It should also be part of the responsibilities of hospitals, cancer centres and detection services. Local voluntary bodies can also contribute.

In schools and training colleges for teachers, the teaching of human biology can include information on cancer. In local clubs and voluntary

groups, lectures and discussions on cancer are particularly valuable, and can frequently be given by ex-patients, with the assistance of local health staff.

### **2.10 Mental health of the cancer patient**

The mental and emotional condition of the patient suffering from a malignant tumour is of great importance in the work of doctors and other staff who provide services and treatment. It must not be forgotten that in cancer control establishments, in outpatient departments, hospital dressing-rooms, X-ray departments or operating theatres, the patient's mental health is subjected to considerable stress. The establishment of conditions that will reduce this stress to a minimum is an extremely important task, not only for doctors but for all medical staff, including the nurses who are in frequent touch with the patients. Not infrequently the serious mistake is made of informing a patient that he has cancer, or handing him a paper of some kind on which the diagnosis of cancer is set down. The medical and nursing staff in charge of a case of cancer should have an agreed policy and division of responsibility regarding the information the patient should receive about his condition. In deciding on this policy, the individual and cultural characteristics of the patient should be taken into consideration.

### **2.11 The role of nursing**

The nurse, the midwife, and the medical auxiliary (e.g., the feldsher) have a special role to play in cancer control programmes. By virtue of their work they are in a strategic situation to participate in early case-finding and referral of patients for diagnosis and treatment. Because they enjoy the confidence of the individual and his family, they have an unequalled opportunity to give helpful advice. The knowledge and skills of public health nursing can be used effectively in family health counselling in a cancer-control programme.

Moreover, the nurse, the midwife and the medical auxiliary will be able to give the sustained support and understanding needed by patients with cancer. In the special clinics and hospitals where the patient is often in a state of great anxiety, the nurse, who is in contact with the patient much more than the physician, has a special contribution to make in the relief of this anxiety.

The process of rehabilitation of the patient, whose pattern of living has been interrupted by the disease and who is receiving or has received a complex and highly individualized form of treatment, calls also for the competence of the nurse and her thorough understanding of the multiple factors involved in the process of restoring the patient to normal living.

Her part in rehabilitation starts with diagnosis and is continued throughout treatment.

The nurse, the midwife and the medical auxiliary are in this sense co-operators with the physician, the patient, the family and the community agencies concerned.

Present knowledge and techniques in cancer control programmes, understanding of the many forms of effective treatment and after-care, and the management of mental stress and of rehabilitation should be taught in basic and post-basic programmes of nursing education.

### 3. ORGANIZATION OF CANCER CONTROL

#### 3.1 The role of the health services—central planning body

The Committee believes that every cancer-control programme should have a central planning body. The function of this body should be to establish policy, set standards, implement operations, co-ordinate efforts 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 Committee also believes that all nations should have a national cancer-control programme of suitable size, planned and carried out within the structure of the official health agency. Control measures, however modest, can then be planned for all parts of the nation and executed under central supervision. The measures employed will vary according to: (a) the system of government, (b) the distribution of population, (c) geographical factors, (d) the density of population, (e) the availability of medical personnel and equipment, and (f) the availability of funds.

The central planning body for cancer control should be composed of individuals as far as possible expert in the several aspects of the programme. It might therefore include surgeons, radiologists, pathologists, health administrators, social workers, lawyers and general practitioners of medicine. Planning should cover all control measures, with appropriate attention to balance as the problem or problems demand; the actual organization of the programme should be entrusted to a competent staff; and the programme should be reviewed by the central planning body at intervals, to ensure that the policy laid down is being followed and is successful. It is essential that a planning body be aware of and quick to take advantage of advances in the field of cancer control, and be able to adjust its operating principles as may be necessary.

There are at present three types of facilities in use in cancer-control programmes:

(1) Completely integrated services in general hospitals or clinics. There is generally little co-ordination of effort or programme except through a regional or national cancer-control body. Each hospital or clinic in a city or locality may have a cancer-control programme. The quality of the clinical service may vary from institution to institution or city to city. There may be, however, fairly complete coverage of the population.

(2) Cancer-control units, limited in number but supplemented by a system of integrated services in general hospitals and clinics. These integrated services are usually restricted to the clinical elements of a cancer programme. There is generally a fair degree of co-ordination of these services through a national or regional cancer-control body.

(3) Cancer-control centres established in regional, district or urban areas. These centres provide complete and highly specialized preventive and therapeutic services. They form a focus for cancer services in the area and serve adjoining hospitals and clinics in a consultative capacity. Training is an important part of the programme, and the public is kept informed of cancer-control measures.

### **3.2 Statistics in cancer control**

Statistical data essential to the administrative bodies responsible for planning and operating a cancer-control programme include the following :

#### *3.2.1 Data on the incidence and prevalence of cancer*

Data on incidence and prevalence are needed to indicate the importance of the cancer problem. When the data can be given separately for various subgroups of the population, such as occupational groups, or for different geographical areas of a country, they will help to ensure a rational distribution and utilization of diagnostic and treatment facilities and personnel. They will also indicate high-risk groups in the population for which preventive measures or special case-finding programmes, such as mass screening, may be required.

The study of incidence data, their time trends, and their variation between different population groups, may often serve as the starting-point for research into the etiology of cancer.

#### *3.2.2 Data on the operation of cancer-control services*

Data on the operation of cancer-control services should permit an assessment of the various components of the cancer-control programme, in particular : the adequacy of diagnostic services, the yield of special case-finding programmes (such as mass screening), the utilization of

various types of hospitals, the methods of treatment (including their long-term effects), the use and efficiency of rehabilitation and after-care services, and the impact on the population of health-education programmes.

### 3.2.3 Sources of data

Data for the purposes mentioned can be obtained from various sources in various ways. The selection of procedure in any particular circumstance will depend upon existing conditions and upon the specific kind of information desired. The various possibilities have been carefully reviewed by the WHO Expert Committees on Health Statistics.<sup>1</sup> Useful information can often be obtained fairly easily and at relatively low cost by the use of materials routinely collected at central institutions (such as official death certificates). The cancer mortality data derived from them have been, and still are, of great value in indicating the extent to which cancer is a health problem. For many forms of cancer they have provided sufficiently accurate indices of incidence for successful use in epidemiological studies.

Other possible sources of information include existing records systems, such as those found in institutions engaged in the diagnosis and treatment of cancer patients, in the offices of practising physicians, life insurance companies, and sickness or other social insurance institutions.

For developing areas, where medical services are non-existent or poorly developed, source material can be obtained by means of *ad hoc* surveys that include physical examination of all or a sample of the population.

### 3.2.4 Methods of collecting and organizing the data

Among the procedures that may be employed in collecting and organizing the data from available sources, two are receiving particular attention at the present time:

#### (1) *The ad hoc cancer survey*

The *ad hoc* cancer survey attempts to obtain information from all hospitals and practising physicians about all cancer patients diagnosed, treated or observed by them during a limited period. This method has been successfully used in the United States of America and in France. The information obtained has in many respects been similar to that obtained by cancer registries. A disadvantage, however, is that the *ad hoc* survey, unless repeated at intervals, furnishes only a static picture of the situation. Furthermore, in the short-term survey it may be difficult to obtain sufficient standardization of the data recorded by a large number of physicians.

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<sup>1</sup> *Wld Hlth Org. techn. Rep. Ser.*, 1959, 164; 1961, 218.

(2) *The permanent cancer registry*

A solution that has been found very useful in a large and increasing number of countries is the introduction of permanent or long-term cancer registration schemes. If well planned and operated, cancer registries can furnish much of the information needed for the rational planning and operation of cancer control services. They are of two main types :

(a) *Registries based on hospital data*

A local cancer registry of some kind probably exists today in most specialized cancer hospitals. Its task is to keep a file of all cancer patients seen by the hospital, including those in outpatient departments. Data pertaining to each patient are recorded on standardized forms, to ensure that all the specific kinds of data desired will, as far as possible, be available for every case. As a rule, the data are detailed ; they may include, for example, details of the patient's history before the onset of cancer, suspected etiological factors, symptoms and their duration, where and when examinations were carried out and their results, the site and type of tumour, the stage of the disease, details regarding treatment, and follow-up information, if any. As a rule, the registry is charged with the responsibility of supervising the follow-up. It is generally recognized that the follow-up of cancer patients should be life-long.

The local cancer registry, with its description and evaluation of diagnostic and treatment services in the field of cancer, must be regarded as an indispensable activity of all cancer hospitals.

The material of the local cancer registry has been used successfully for certain types of epidemiological studies, but the data do not permit the computation of incidence rates, except in the rare circumstances when the background population (denominator) can be defined.

In some countries the data compiled by a number of local registries, all using uniform methods, are compiled and analysed by a central registry. Where this is done, the possibility of undertaking interesting comparisons is greatly increased. For example, it may sometimes be possible to compare survival in a certain form of cancer between institutions using radiotherapy predominantly and others where surgery is the preferred method. It must always be remembered, however, that in addition to differences in technical facilities and in treatment concepts and skills, there are also likely to be differences between centres with regard to the selection of cases that they admit.

(b) *The population-based cancer registry*

A population-based cancer registry attempts to collect as detailed information as is practicable about all newly recognized cases of cancer

in a population of known size and composition. The population covered may be that of a whole nation, or any definable subdivision thereof. To achieve this, it is necessary to collect information from many sources, such as clinical departments, pathological laboratories, practising physicians, and official death certificates.

In some countries cancer registration is based on compulsory notification, in others on voluntary co-operation from the doctors. The introduction of notification may be of assistance in that it serves to emphasize that the scheme is considered of great importance by the authorities. It also reduces the problem of confidentiality. As far as the efficiency of registration is concerned, however, it is generally felt that there is little to choose between compulsory and voluntary reporting. What matters is that the objectives of the scheme are carefully explained to the medical profession, that results can be presented that will justify the efforts, and that the registry is willing to render service to whoever requests it.

The population-based registry is a very comprehensive undertaking that makes great demands on personnel, equipment and funds. If efficiently operated, this kind of registry will be a very rewarding undertaking. Some of its main functions may be outlined as follows :

(i) Like the local hospital registry, it will provide a description and evaluation of the services provided by all or any of the hospitals covered. In contrast to the local registry, it will in addition furnish information regarding cases that are not seen by the hospitals, and it is in an excellent position to study the cancer services as well as to bring to light differences (e.g., as regards region, social class) in their coverage and quality.

A very important feature of the efficient population-based registry is the relatively unselected nature of its material.

The significance of this in epidemiological as well as clinical studies is generally recognized. For example, the picture that the population-based registry presents of the clinical characteristics of some forms of cancer (e.g., resectability rate and survival rate in bronchial carcinoma) will often differ radically from that provided by the local registry of a highly specialized institution.

(ii) An important function of the population-based registry is to assist in the evaluation of new programmes in cancer control. For example, when mass screenings are undertaken, this type of registry is excellently suited to furnish the standards needed for assessing the value of the project. Knowing the rate at which new cases of cancer are normally diagnosed in any definable segment of the population, their stage, distribution, treatment and survival experience, the registry is in a position to establish "expected" values against which the data from a well-executed mass screening can be contrasted.

(iii) The function of the population-based registry that has received greatest attention in many quarters is the study of cancer incidence. From the data that are collected, incidence rates can be computed separately for the various forms of cancer, for each sex, for the various age groups, for the urban and rural part of the population, for persons employed in special occupations, and for any other subgroup of the population for which not only the appropriate figure for the numerator, but also that for the denominator, is known. As a result, a more or less detailed picture emerges of the pattern of cancer occurrence in various segments of the population. Wherever data of this kind are available, they are obviously of great value in indicating the cancer problems of the population, and variation of these with time, place, personal characteristics, and a number of other factors.

While it is generally conceded that the study of such variations may permit the formulation of hypotheses regarding their causes, and may thus provide important leads in research on the etiology of cancer, nowhere as yet has the potential value of cancer registry material for this purpose been explored to any great extent. This is doubtless in part due to the inadequate staffing of the majority of registries.

(iv) Cancer registries should be prepared to render assistance to the physicians who support them. They are often in a position to do this without too much effort—for example, by making information available or by giving advice, thereby furthering research in cancer and frequently also in other fields when studies require a methodology familiar to registry personnel.

In this respect, it is of importance to note that cancer registries are in some places the first and only institutions fully devoted to work in chronic disease epidemiology, statistical evaluation of health services, survival studies, and other applications of medical statistics.

### 3.3 Methods of detection and diagnosis

The detection and diagnosis of cancer is facilitated by the application of such well-established methods of clinical examination as a complete history and inquiry into function, physical examination, and routine laboratory tests.

Additional more specific methods include some of relatively recent origin. Although each may be a source of useful information, the Committee is of the opinion that whenever possible a definite conclusion should rest on the results of more than one test.

The most commonly used methods of detection and diagnosis can be described under the headings of radiological, cytological, and histological.

### 3.3.1 *Radiological*

X-ray examinations form an indispensable part of diagnostic procedures in regard to most malignant tumours.

Since X-ray departments for diagnostic purposes already exist as integral parts of all well-planned general hospitals, this offers an opportunity, as far as X-ray examinations are concerned, for the decentralization of the diagnosis of cancer. Many countries have in fact taken advantage of this situation in their efforts to integrate cancer-control measures with already existing components of their health services.

There are often, however, limitations to the diagnostic services which general hospitals can render. Many will not be equipped with X-ray facilities for such purposes as tomography and angiography, or for special examinations of soft tissues, such as mammography, which have proved to be of some value. It is essential that the central planning body make these highly specialized techniques available in such places and in such number that when the need arises patients can be referred to them for additional study.

In this context, it is pertinent also to mention the use of X-ray diagnostic techniques to screen for cancer, as a by-product of mass chest X-ray screening programmes carried out primarily for the detection of pulmonary tuberculosis. An impressive number of lung tumours have been detected in some studies. In Japan, screening for gastric cancer is carried out on a large scale in some areas by means of mobile X-ray units.

### 3.3.2 *Cytological*

One of the most common methods of detecting early stages of cancer or inaccessible cancers is cytological examination. The use of exfoliative cytology is most promising in some types of cancer, for example, gynaecological cancer, cancer of the lung, of the urinary tract, of the stomach, and in certain types of skin cancer. It is also of value in the examination of body fluids. To improve results in the detection of cases of cervical cancer, colposcopy and colpomicroscopy may also prove to be useful.

The need for educating physicians and medical students on the advantages of cytology, and for adequately training pathologists and technicians in this new and rapidly growing field of detection, is very great.

Training facilities, as well as ideas on whom, what and how to teach, vary tremendously. This is a reflection of the relatively early stage of development of this discipline.

The Committee feels that more extensive application of cytological methods offers particular promise, and makes the following recommendations:

- (1) Facilities for cytology should be provided in as many places as possible and desirable.

(2) Cytopathology should be regarded as a distinct subspecialty of pathological anatomy, and cytological laboratories should be linked with pathology institutes.

(3) Young physicians should be encouraged to work in cytology. Training should follow acquisition of a sound background of pathology and clinical work (e.g., gynaecology, urology) and should extend over at least one year.

(4) Government authorities, such as the health service, should foster cytopathological centres as an excellent adjunct to mass screening for certain types of cancer.

(5) Medical students should have an opportunity to learn about the conceptual basis and the value of cytology.

(6) Cytological centres should have facilities for the training of cyto-technicians as well as for training doctors and students in this special field.

(7) Diagnostic reference centres should be promoted as widely as possible.

(8) Research in the field of cytology should be given support. Research could help to improve techniques and the development of such methods as fluoroscopy, enabling more investigations to be carried out. It could also increase knowledge of the biology and biochemistry of the cancer cell.

### 3.3.3 *Histological*

(1) *Biopsy* : The choice of biopsy technique is dictated by the site of the tumour. In the identification of inaccessible tumours the use of quick sections as a means of examination of surgical specimens is helpful. Other techniques include aspiration, and drill and punch biopsies. The conization methods of biopsy provide the best material for the diagnosis of cervical lesions. Biopsies should be performed in such a way that adequate representative material is obtained.

(2) *Examination of specimens* : To provide information that will be of assistance in planning further treatment and suggesting the prognosis, it is important to carry out thorough macroscopic and microscopic inspection of surgical specimens as a supplement to any biopsy examination that may have been performed. This inspection should include the primary tumour, the regional lymph-nodes, and other tissues that may have been invaded.

(3) *Autopsy* : The post-mortem examination of cancer patients provides a source of information useful in the understanding of the different aspects of the disease, and also a good opportunity to study the alterations produced by the different types of treatment. Close co-operation should be maintained between institutes of pathology and cancer registries.

#### 3.3.4 *New methods under study*

In addition to the above methods a number of others may be mentioned. For the most part, the methods must be considered at present as experimental.

(1) *Circulating cancer cells in the peripheral blood* : The Committee does not believe that the identification of cancer cells in the peripheral blood should be regarded or employed as yet as an established routine method of detection or diagnosis. Much laboratory and clinical investigation is under way in an effort to elucidate the phenomenon of floating cells in the blood. Ultimately this research should determine whether or not the presence of cancer cells in the blood has diagnostic or prognostic significance.

(2) *Enzymology* : The concentration of certain enzymes in the body is altered by cancer of the prostate that has spread beyond the capsule, and by the invasion of bone by other malignant tumours ; and the presence of a malignant tumour will alter the enzyme content of some vital organs. Since much of this field is still under investigation, the Committee does not believe that the measurement of enzymes can be recommended at present as a specific method of cancer detection.

(3) *Immuno-mechanisms* : The Committee recognizes the importance of the mechanism of immunity to cancer observable in the human organism, but believes that much more research is necessary in defining and measuring this response before any practical diagnostic method can be forthcoming.

(4) *Radioisotopes* : Although in certain cases, such as cancer of the thyroid, radioisotopes are helpful in detection and diagnosis, they must in all cases be administered only by experts, and the greatest caution must be exercised in interpreting the results of tests. Methods employing radioisotopes are for the most part of clinical value only as supplements to other and more specific methods ; their chief role in relation to cancer is to be found in laboratory research programmes.

(5) *Miscellaneous* : This includes many tests, chemical, hormonal and others that are still under investigation.

#### 3.4 **Organization of treatment—the team approach**

For a constantly increasing number of cancers several techniques are needed in treatment, covering the fields of surgery, radiology, and chemotherapy (including hormones). It is consequently desirable that the plan of treatment be determined, not by a single specialist, but by a team, and this team approach should be organized as widely as possible.

The team should consist of a representative of each specialty concerned with the diagnosis or treatment of the cancer concerned. The aim should be to employ, often in combination, techniques that will give the best results with the least effect on the patient. Such a team may work in

different conditions, e.g., in (a) a specialized centre, (b) a general hospital, or (c) away from its specialized centre, as a travelling team improving the knowledge of the local physician. In (b) and (c), treatment may be given on the spot, or in the specialized centre, or in both, according to the facilities available.

In each of the above-mentioned eventualities, it is desirable that the team as a whole, being responsible for the decision on treatment, should also supervise the implementation of the plan of treatment as well as the rehabilitation and long-term follow-up of the patients.

In order to meet these responsibilities, the team may need the collaboration of other specialists, in, for example, plastic surgery, stomatology, or phoniatory.

### 3.5 Voluntary organizations

In many countries voluntary bodies have been formed to further the campaign against cancer. They constitute an important component of the national anti-cancer effort. Some of these bodies are closely linked with the government cancer-control agency, others are completely independent. On rare occasions, the voluntary campaign against cancer is the main one in the country, enjoying varying degrees of government co-operation and support. Ideally, the voluntary agency seeks to demonstrate the desirability and feasibility of an anti-cancer programme or programmes, its ultimate aim being that the programme should be adopted by the authorities, and the activity should be incorporated within the structure of the government health services.

The programme of the voluntary agency should be based on the principles and practices of modern cancer control as set forth by experts. Frequently such an agency can undertake programmes that would be difficult or impossible for a government to initiate quickly or effectively. Non-governmental and governmental agencies can combine in a major approach or activity that will have an enormous effect on a given situation or problem.

Volunteer workers in a cancer-control programme are of great value. Examples of activities they may usefully engage in are record-keeping, the transport of patients to and from hospital, occupational therapy, and the entertainment of patients.

Experience has demonstrated that financial support of the voluntary agency by public subscription often brings about an increase in the budget of the official cancer service or the funds devoted to cancer by the government. On the other hand, an increase in the official budget does not necessarily depress the income of the voluntary body.

The Committee believes that voluntary agencies have a valuable and important role in cancer control in some countries, where people are

interested in helping to carry out or improve programmes. It is imperative that there should be the closest possible co-operation between voluntary and official agencies and co-ordination of their cancer control programmes.

#### 4. RESEARCH ON DIFFERENT ASPECTS OF CANCER CONTROL

Despite the knowledge accumulated over the years on many aspects of cancer control, medical and allied services have been handicapped by lack of knowledge in various fields. This includes : (1) lack of information on the cause or causes of the initiation of cancer ; (2) lack of a satisfactory test or tests for the detection and diagnosis of cancer in inaccessible sites ; (3) lack of a specific agent or agents for the chemical treatment of local and systemic cancer ; and (4) lack of specific methods for increasing the individual's resistance to cancer.

Cancer control would clearly take a tremendous step forward if the requisite knowledge were obtained on any of these points.

The Committee was impressed, however, by the progress that has been made in cancer control in many countries of the world. It is apparent that research efforts generally have contributed significantly to the advances observed, and it may be presumed that the results of laboratory and clinical investigation will assure increasing success in the ability to control cancer.

Cancer research in general may be classified into two main categories : (1) basic (fundamental) and (2) applied (targeted). Apart from its administrative value, this classification may be considered artificial, however, and a better classification might be into the following broad areas :

(1) *Investigation into the genesis of cancer* : studies of inciters (physical, chemical, and viral), trauma, mutations, epidemiology, etc.

(2) *Investigation into the nature of the normal and the malignant cell* : this will involve such disciplines as biochemistry, biology, pathology and biophysics.

(3) *Investigation into the host-tumour relationship* : this will involve immunology, biochemistry, pathology, epidemiology, and many other disciplines.

(4) *Investigation of therapy* : surgery, radiation, and chemotherapy will all be concerned, but therapeutic studies are especially important, and pre- and post-operative management, the electrolyte balance, nursing, anaesthesiology, etc., must be considered.

It is obvious from a scrutiny of these broad areas that fundamental research into biology and medicine is needed. The acquisition of fundamental knowledge will afford valuable opportunities for applied research,

The Committee therefore strongly urges the continued prosecution of basic research in biology and medicine, realizing that only from such research can applied research be derived. At the same time, it strongly recommends that research be undertaken in those fields of cancer control in which identifiable gaps in knowledge exist.

There are several areas in which specific research can be undertaken in the expectation that the answers procured will contribute quickly and significantly towards the control of many types of cancer. Some examples of research needed are :

- (1) population studies—epidemiology of different cancer sites, including study of their geographic distribution in different parts of the world ;
- (2) studies of conditions associated with a high risk of cancer ;
- (3) investigation of the smoking habits of youth ;
- (4) new screening techniques and methods of cancer detection and diagnosis ;
- (5) studies of the end results of treatment ;
- (6) assessment and comparison of new and existing methods of treatment, including therapeutic trials ;
- (7) international survey of cancer autopsy material in order to assess information on a geographical basis ;
- (8) statistical studies on the correlation between early diagnosis and the survival rate ;
- (9) study of the reasons for delay in the diagnosis of cancer.

It is recommended that information on these and similar subjects be gathered nationally and collected by the appropriate international organizations, in particular WHO, with a view to disseminating the results as widely as possible. The study and statistical treatment of these research results should provide valuable data for international and national use.

## 5. CONCLUSIONS

The Committee, having reviewed on the one hand the role played by cancer as an ever-increasing cause of mortality and morbidity, and on the other the impressive results achieved in some countries—especially as far as improved survival rates are concerned—urges responsible authorities in each country to develop a considered national cancer-control policy.

The Committee realizes that the degree and speed of implementation of a cancer-control programme in a given country will depend upon the priorities of the health programme as a whole and of the financial and manpower resources available.

Certain general principles may be outlined, however ; they should be taken into consideration in all cancer-control programmes. If cancer control is to be effective :

(1) it must be carried out on a national scale, that is, it must cover all population groups in the country ;

(2) cancer services must be available to every patient, provide full facilities for prevention, detection, diagnosis, treatment, after-care and rehabilitation, be staffed by qualified personnel, and have the appropriate equipment at their disposal ;

(3) there must be teamwork between specialties, teamwork within the individual institutions, and co-operation between institutions working in the field of cancer and the public health authorities, clinics, outpatient departments, research institutes and medical schools ;

(4) health education of the public and the medical and allied professions must be undertaken on a broad scale ;

(5) particular attention must be paid to the training of specialists in the various fields of oncology, medical practitioners, and allied medical personnel ;

(6) there should be comprehensive cancer registration that will furnish accurate statistics on morbidity and mortality and assess epidemiological factors ;

(7) diagnostic reference centres (radiological, histological, cytological) should be promoted ;

(8) research should be encouraged into every aspect of cancer. As far as possible research projects should be planned in such a way as to make international comparison possible. This is particularly important in the statistical and epidemiological approach to the cancer problem as well as in studies on the geographical distribution of the various types of malignant tumour ;

(9) appropriate legislation should be promoted and developed.

The further development of national cancer control programmes requires extensive international co-operation, at both governmental and non-governmental levels.

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