Along with other chronic non communicable diseases, cancer is gaining increasing importance as a public health issue and affects approximately 0.8 million new cases every year in India.

WHO in the year 2000 conducted a global burden of disease study evaluating the Disease Adjusted Life Years (DALY) lost from various chronic non communicable diseases. DALY was used as a combined measure of the years of life lost due to premature mortality in the population and the years of life lost due to disability. The findings of this study showed that in India the 8.7 million Disease Adjusted Life Years lost from cancer was second only to ischaemic heart disease (14 million) and more than stroke (6 million) and diabetes (2 million). Anticipating the emergence of cancer as a public health problem, the Indian National Cancer Control Programme (NCCP) was initiated in 1975 and then revised in 1984 and 1994.

The NCCP set itself a very laudable and ambitious goal of reducing the morbidity and mortality from cancer in India. To achieve its goal of reducing the morbidity and mortality from cancer, NCCP chose the most pragmatic approach of prevention and down staging along with better treatment and care for our common cancers. Considering the limited resources devoted to nation’s health, some critics then questioned the wisdom of initiating a ‘National Control Programme’, for a complex life style related disease such as cancer in a country where millions of children and adults were dying of diseases far more preventable and curable than cancer. Nevertheless within two decades, NCCP has proven its utility and has grown beyond a data collection and Telecobalt and morphine distribution exercise. The national control programme in cancer is the most mature and perhaps a good reference for the emerging national programmes for other non communicable chronic diseases in India.

NCCP has been around for a reasonably long time to be judged on its performance and what dividends have come from this national coordinated effort involving several governmental agencies. The best dividend so far has been the National Cancer Registry Programme (NCRP), initiated by ICMR in 1982. Despite some deficiencies in coverage and accuracy, the NCRP data gives us reasonable estimate of the cancer burden in selected urban and rural areas of the country. Very few countries outside the western world have such information on the cross section of their population. Thanks to the NCRP, today we can make emphatic statements such as stomach cancer is more common in Chennai; cancer incidence is much lower in rural Barshi; and that breast cancer has overtaken cervical cancer in most metropolitan cities. We now have trends in cancer incidence over time and also some indicators, though somewhat incomplete, on cancer mortality in selected registries. The NCRP data from selected population and hospital based cancer registries and more recently through the WHO supported Cancer ATLAS project covering many more urban and rural regions, clearly shows the wide variation in the incidence and type of cancers across our vast country. This incidence data has internal consistency and allows us to speculate the underlying reasons behind these intriguing findings and to plan appropriate prevention, treatment and rehabilitation strategies.

The other major dividend of the NCCP is to bring this emerging health problem in sharp focus of the national health agenda by producing consistent data on the burden of cancer; deficiencies in treatment or rehabilitation facilities; and lack of trained personnel. Through its programmes and findings, the NCCP has sensitized and aided not only the health planners but has also made oncologists, whose focus is generally on treatment, more aware of the need for prevention and rehabilitation.

With these two distinct but early achievements, the Indian NCCP is at crossroads where the choice of strategies would decide how soon we would achieve the goals of reducing the morbidity and mortality from cancer. Here I would argue for the case and place of research in a national ‘Control’ programme for a life-style related disease, posi-
tioning research not at the forefront of NCCP but as its ‘si-
lent engine of change’ along with strategic planning and
optimal governmental support.

RATIONALE FOR RESEARCH IN A CANCER ‘CONTROL’
PROGRAMME

For the cancers that are common in India, much is already
known regarding highly effective ways to prevent, down-
stage and then cure these down staged cancer. Hence one
may question the utility of research by or on behalf of the
NCCP for achieving its goals. From its inception, without
invoking major research, NCCP made efforts in selecting
strategies which it thought would be effective and imple-
mented few pragmatic policies. Nevertheless, lack of ‘sub-
stantial and demonstrable impact’ on the incidence and mor-
tality of cancer, as a direct result of three decades of NCCP
programmes, highlights the enormity of the task and the
barriers which prevent implementation or fruition of strat-
egies proven in other parts of the world. To achieve the
goals of NCCP, a two pronged approach is needed wherein
proven and feasible strategies are implemented effectively
in parallel with concerted research in several key areas of
hope and frustration [Table 1].

As a nation we do believe in research and the field of can-
cer is no exception. It really is a multi-million dollar ques-
tion whether we need additional strategies and allocation
for research by or on behalf of the NCCP, when research in
several aspects of cancer prevention, biology and therapy
is being actively pursued by researchers and institutions
across the country? Over the past decade, these investiga-

<table>
<thead>
<tr>
<th>Table 1: Research inputs for initiatives required for fulfilling important NCCP goals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NCCP Goals</strong></td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Expand coverage of population based cancer registries (PBCR) and improve quality of data on incidence, morbidity &amp; mortality</td>
</tr>
<tr>
<td>Identify groups at ‘high risk’ and ‘very high risk’ of developing specific cancers.</td>
</tr>
<tr>
<td>Implement research tested programmes for prevention &amp; down staging of common cancers on ‘high’ &amp; ‘very high’ risk groups</td>
</tr>
<tr>
<td>Establish good clinical governance rules suitable for implementation at different levels of cancer care</td>
</tr>
<tr>
<td>Wider availability of curative treatment for early stage cancers</td>
</tr>
<tr>
<td>Holistic palliative care for patients with advanced cancers</td>
</tr>
<tr>
<td>Monitor effective implementation of NCCP programmes, pattern of care and treatment outcome studies</td>
</tr>
<tr>
<td>Human resource development for various NCCP programmes</td>
</tr>
<tr>
<td>Prioritizing efforts &amp; funding for competing cancer prevention, treatment and palliative measures.</td>
</tr>
</tbody>
</table>
tors and institutions have benefited from a larger and better trained workforce as well as increasing funding opportunities through several intramural and extramural programmes of the Indian government, spearheaded by the ICMR, DBT, DST, CSIR, DAE and a few international agencies. However, with the exception of certain national task force programmes and few ICMR programmes, these investigator or institution initiated research programmes are curiousity, opportunity or publication driven research projects and rightly so. While such basic, epidemiological or clinical research should be encouraged and supported,[7] answers from such research programmes may not necessarily provide ready solutions or have ‘direct and immediate’ relevance for reducing the morbidity and mortality from cancer in the ‘population’, the overarching goals of the NCCP. This brings out the need for a focussed research approach, designed specifically for the NCCP goals, coordinated and funded either by NCCP or other governmental agencies in synchrony with the NCCP. It is imperative that before launching any major national programme, NCCP should conduct research to test its efficacy, applicability, and cost effectiveness in our unique Indian milieu. More importantly, since most of the existing and supposedly effective approaches do not lend themselves to simple and affordable implementation at the national scale, NCCP would have to conceive, support and test a large number of novel research leads in the hope that at least some of them would prove to be effective and be practical for large scale implementation.

**SETTING SIGHT ON SHIFTING TARGETS**

The success of the NCCP in a country as diverse, large and populous as India, will hinge upon the appropriateness of the targets it sets and how it proposes to achieve them within the pre-defined time frame. Lack of objective and relevant goals and targets and their timely achievement has often been the bane of Indian public policy and the NCCP is perhaps no exception. However, with the experience it has gained over three decades [Table 2], NCCP is in a better position of setting realistic goals and specific time bound targets and devise suitable strategies for achieving them [Table 2,3]. The issue is becoming more complicated now with a shifting target, primarily due to the rapid changes in the demography and life style in this diverse and populous country. Life style of the common man is changing fast and is already manifesting in the changing pattern of chronic diseases including the incidence of different cancer types.[11] In addition to the major differences in the incidence of various cancers in different urban and rural areas of India (NCRP and Cancer ATLAS data), some interesting data has emerged from the study of cancer patterns among Indians who have migrated to the United States. Jain *et al*[8] have recently reported much lower rates of cervical, oral and pharyngeal cancers among Indians living in California as compared to the Indians living in India. In contrast, Indians living in California had a higher rate of prostate, colorectal, breast and lung cancer which is ex-

---

**Table 2: Population indices reflecting cancer incidence, prevalence, mortality, morbidity and treatment outcome**

<table>
<thead>
<tr>
<th>Area</th>
<th>Present status</th>
<th>Short term targets (for next 5 years)</th>
<th>Long term targets (subsequent 5 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population Cancer</td>
<td>Significant progress made by NCRP (ICMR) which now covers approximately <em>5%</em> of</td>
<td>Improve Coverage and Quality</td>
<td>Improve Coverage and Quality</td>
</tr>
<tr>
<td>Incidence data</td>
<td>Indian population, WHO supported Cancer ATLAS also published</td>
<td>1. Cover 7% of population in Population based registry</td>
<td>1. Cover 12% population in population based registry</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Cytological/ histological diagnosis in &gt; 85% of all cancer cases in</td>
<td>2. Cytological/ histological diagnosis in &gt; 95% of all cancer cases in the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the covered population.</td>
<td>covered population.</td>
</tr>
<tr>
<td>Population Cancer</td>
<td>Some data available but gross under reporting from several registries except</td>
<td>Expand coverage &amp; quality</td>
<td>Expand coverage &amp; quality</td>
</tr>
<tr>
<td>Mortality data</td>
<td>Chennai</td>
<td>Ensure registration of &gt;80% of all cancer related deaths in the population</td>
<td>Ensure registration of &gt;90% of all cancer related deaths, including toxicity</td>
</tr>
<tr>
<td>[Top Priority]</td>
<td></td>
<td>based cancer registries.</td>
<td>related deaths in the population based cancer registries.</td>
</tr>
<tr>
<td>Population Cancer</td>
<td>Minimal data</td>
<td>Initiate generation of basic data</td>
<td>Expand coverage and quality</td>
</tr>
<tr>
<td>Morbidity data</td>
<td></td>
<td>Morbidity data on 10% representative sample from selected 2 urban and 1</td>
<td>Morbidity &amp; QOL data on 20% representative sample from selected 3 urban</td>
</tr>
<tr>
<td></td>
<td></td>
<td>rural registries for 3 common cancers in males and females</td>
<td>and 2 rural registries for 4 common cancers in males and females</td>
</tr>
<tr>
<td>Population Cancer</td>
<td>Hospital based data generation initiated. No population based data available</td>
<td>Initiate population based data</td>
<td>Expand coverage and quality</td>
</tr>
<tr>
<td>Management and Outcome</td>
<td></td>
<td>Intent &amp; Modalities for treatment and 2 year outcome in &gt;75% cases</td>
<td>Intent &amp; Modalities for treatment and 3 year outcome in 85% cases detected</td>
</tr>
<tr>
<td>data</td>
<td></td>
<td>detected with the 2 commonest cancers in males and females</td>
<td>with the 3 commonest cancers in males and females in PBCRs</td>
</tr>
<tr>
<td>[High Priority]</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ICMR: Indian Council for Medical Research; NCRP: National Cancer Registry Programme; PBCR: Population Based Cancer Registry

*Personal Communication with Dr. A Nandakumar*
Reverse trends in tobacco use through awareness & intervention programmes

Reduce new tobacco users in population by 2% per year

Focus: 13-21 year male population

Early detection of common cancers through awareness and screening of ‘high risk’ cases

Goal: Detect in early stage I/II
(In Selected 4 Registries)
40% of all oral & cervix cancers in that population
30% of all breast cancers in that population
10% of Lung & Oesophagus cancers in that population

Goal: Detect in early stage I/II
(In Selected 7 Registries)
75% of all oral & cervical cancers in that population
50% of all breast cancers in that population
25% of Lung & Oesophagus cancers in that population

Demonstrate reduction in population cancer incidence

Goal: Reduce or Stabilise incidence
Cervix: 2% reduction per year
Head & Neck (H&N): Stabilise
Breast, Lung & Oesophagus: Limit rise to < 5%/year

Goal: Reduce incidence
Cervix: 5% reduction per year
Head & Neck: 5% reduction per year
Breast, Lung & Oesophagus: Stabilise

Demonstrate reduction in population cancer mortality

Goal: Reduce or Stabilise mortality
Cervix: 5% reduction per year in population
Head & Neck: Stabilise mortality in population

Goal: Reduce or Stabilise mortality
Cervix: 7% reduction per year in population
Head & Neck: 7% reduction per year in population
Breast, Lung & Oesophagus: Stabilise mortality

Cervical Cancer

The ongoing major programme for awareness and public health for sexual transmission of HIV will indirectly benefit the NCCP by reducing the HPV transmission and therefore the risk of cervical cancer. Within a decade or two, a major reduction in the incidence of cervical cancer, which is already witnessing a downward trend in several registries, will therefore not be surprising. Screening and vaccination of the entire at risk female population of the country is unlikely to become a reality in the next few decades and by then we expect the cervical cancer rates to have come down substantially due to improving hygienic standards and as a spin off of the HIV crusade. In the meanwhile, ongoing research into cervical cancer screening and vaccination in the Indian milieu may provide some pragmatic and cost effective solutions suitable for screening and vaccination of our high risk population. In the post HPV era, we need further research to accurately define the high risk population, which itself may be several million women, and then test novel or cost effective methods of screening and treatment.

Tobacco Related Cancers

Scenario for the tobacco related cancers is also changing and this has to be seen in the light of changing trends in tobacco consumption as has been brought out in the serial national sample surveys. While there is a trend towards decreasing incidence of oral cancers in few Indian registries, lung cancer is fast becoming the most common cancer in several registries (Cancer ATLAS). The reduction in the oral cancer incidence is explained by the reduction in per capita use of all forms of tobacco including the smokeless form, though reliable long term time trends for gutka use are not yet available. However, the reported reduction in the per capita use of cigarette and beedi smoking from 1987 onwards as observed in the national sample surveys is yet to reflect in a downward trend for lung cancer. Even if some reduction in lung cancer incidence becomes evident in the near future, it will continue to remain a common male cancer in the country. Since unlike oral cancer, lung cancer is not amenable for early detection and offers little scope for cure in advanced stages, primary prevention is the real hope for reducing lung cancer mortality. The same is true for oesophageal cancer.

Breast Cancer

Based on major trends among the inhabitants of metropolitan Indian cities as well as Indians living in USA, breast cancer will be the most formidable cancer problem for the Indian women [Table 3]. As compared to other cancers, modulating the risk factors for effective primary prevention of breast cancer is the most difficult task. Reproductive factors cannot be reversed to reduce the risk of breast cancer in the present socio-economic state and mammo-
graphic screening may neither be feasible nor very efficacious in the relatively younger population of India. Hence our best bet to partially offset the rising tide of breast cancer is through public awareness for adoption of healthier life style, diet, exercise, promoting breast feeding, breast awareness, self or physician breast examination and high risk or opportunistic screening using appropriate technology.

**Childhood Cancers**

Though childhood cancers account for only a small fraction of all cancers, they deserve special attention in view of the high cure rates possible both for leukaemia and solid tumours and the maximum impact on the disease adjusted life years that can be achieved with optimal treatment. We need few centres of excellence in our country for optimal multidisciplinary treatment, rehabilitation and research in childhood cancers. With a disproportionately larger Indian population in this age group, special emphasis on their curable cancers is very pertinent.

**Gall Bladder Cancer**

It is now well recognized that gall bladder cancer is becoming one of the most common cancer in women in some regions of north India (Cancer ATLAS). Before the problem reaches epidemic proportion, we need coordinated and focussed research towards understanding of the etio-pathology, early detection and better treatment for the typical presentation of advanced gall bladder cancer.

**Other Cancers**

Several other cancers such as colorectal cancers, stomach cancers, prostate cancers and haematolymphoid neoplasia also contribute to the total cancer burden and have shown some interesting trends. For each of these cancers, we need different prevention, early detection and management strategy. Despite the continued economic and technological progress in the country, mass public screening tools for some of these common cancers such as colonoscopy and PSA are unlikely to become feasible within the next few decades. Hence identifying and modulating risk factors, developing affordable yet effective methods for down staging, opportunistic or high risk screening and improved minimum standards of care would be the best option for reducing mortality [Table 4].

**BUILDING BRIDGES WITH OTHER NATIONAL HEALTH PROGRAMMES**

Cancer, a life style related disease cannot be seen in isolation from other health threats faced by the country. In fact NCCP and National programmes for non communicable diseases (NCD) such as cardiovascular & diabetes will help each others cause through their common emphasis on healthier life style, diet, tobacco avoidance and physical exercise. Working together with other NCD programmes and by sharing resources and expertise, we have a better chance of making fight against tobacco and other unhealthy life styles as the central point of the nation’s long term health agenda.[1] This is the only hope against the rising tide of deaths and disability from most of the common cancers, cardiovascular diseases and diabetes. The spin offs from the crusade against AIDS will also reduce the sexual transmission of HPV, thereby reducing the risk of cervical cancer, as well as reduce the risk of hepatocellular carcinoma by reducing the transfusion and needle acquired transmission of hepatitis B and C virus.

**BUILDING INFRASTRUCTURE & HUMAN RESOURCES FOR LONG TERM GOALS**

Considering the burden of cancer and the public expectation, NCCP has little choice but to set some tough targets in order to diffuse the developing crisis. Taking into account our present and projected cancer burden, infrastructure, human resources, socio-economic status as well as our improving capabilities, we need to set ourselves specific targets for each area as listed in tables 1-5. Due to a very long latent period between exposure and disease manifestation and a variable natural history it takes a long time to judge the efficacy of any preventive or therapeutic intervention for cancer. Hence for public health policy for such a disease, it is more important to define, discuss and set the long term goals (10 year) and then work backwards to fix the short term and intermediate targets that should be achieved within the next 5 years. We need to take a holistic view covering the entire spectrum of prevention, therapy, palliative care, regions, human resource and specialties. We have no choice but to grapple with contentious issues of prioritization and relative allocation from the limited resources available for health in general and cancer in particular. Setting aside major NCCP portfolio for primary and secondary prevention in the face of ever increasing demands for providing minimum cancer care services will not be an easy task. However, in order to achieve the long term goal of reducing morbidity and mortality from cancer in the population, prevention and down staging of common and emerging cancers will have to remain at the centre of the NCCP strategy and merit special consideration for resource allocation. Moreover, NCCP through the public health system and NGOs will have to share almost the entire burden of prevention and down staging since the health care industry, hospitals and individual researchers are not expected to make major contributions in this area.

Early detection and awareness initiatives of the NCCP may give rise to a rather piquant situation wherein the demands
on cancer departments and hospitals may increase exponentially due to a larger number of early stage curable cancers that require greater expertise and better infrastructure for uncomplicated cures [Table 4,5]. We are also facing ever increasing public expectations and more resources are being devoted even in government funded hospitals for complex, prolonged and resource intensive treatments of advanced cancers, sometimes merely for improving the quality of life of these unfortunate patients. If the cancer diagnosis and treatment facilities are unable to keep pace, the unmet demands may lead to disillusionment among patients, physicians as well as health planners. Since this requires major policy decisions and major fund allocations, this issue needs a very serious thinking and in depth analysis to arrive at a consensus at the earliest. We need to develop working models of alternative financing, including pragmatic and affordable insurance for the cancer patients and investment from the private health care sector to augment the cancer treatment infrastructure.

It really is a billion dollar question from where and when we will get resources to meet the shortfall of 700 teletherapy machines. These 700 machines along with associated civil work, cobalt source and planning equipment, may cost well over Rs 2000 Crores (Rs 20 Billion or 0.4 Billion US Dollar). Since governmental funding can support only a fraction of this demand in the immediate future, one has to explore the model of sharing some of expensive radiotherapy equipments used for treatment planning and Brachytherapy. We also need a major boost and support for the programme for the development of indigenous and cost effective technology [Table 5]. While the initial R&D work

### Table 4: Minimum Clinical Management Recommendations (MCMR)

<table>
<thead>
<tr>
<th>Present status</th>
<th>Short term targets: (for next 5 years)</th>
<th>Long term targets: (for subsequent 5 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Define stage wise evidenced based MCMR for common cancers</td>
<td>Define and refine MCMR for more clinical contexts and cancers</td>
</tr>
<tr>
<td>Unlike most <em>developed countries, no centralised or population based cancer management guidelines from Indian health policy makers.</em></td>
<td>Consider magnitude of benefit in community setting (which is often less than in trial setting), age, co-morbid conditions and affordability by the public health system if the masses cannot afford its cost.</td>
<td>Consider magnitude of benefit in community setting (which is often less than in trial setting), age, co-morbid conditions and affordability by the public health system if the masses cannot afford its cost.</td>
</tr>
<tr>
<td>Few centres (e.g. Tata Memorial Hospital) and professional bodies conduct regular Evidence Based Management (EBM) courses and produce EBM guidelines for different cancers.</td>
<td>Improve the availability of efficacious and cost effective approaches through resource reallocation, training and for non affording patients, partial or full waiver through government or other charity schemes. Example: Staging CT scan for operable lung cancer, weekly Cisplatin during RT for certain groups of Cervix and H&amp;N Cancers, CMF, CAF or Tamoxifen for breast cancer, post operative RT in certain groups of breast and H&amp;N Cancers; 5FU for colorectal cancers etc.</td>
<td>Improve the availability of efficacious and cost effective treatments through resource reallocation, training and for non affording patients, partial or full waiver through government or other charity schemes.</td>
</tr>
<tr>
<td>No regional or national audits of adherence to EBM guidelines.</td>
<td>Ensure free or subsidized treatment for individual patients through government or other charity support if it produces remarkable cure rates (&gt;30% improvement in long term cure over the cheaper or affordable option) with some maximum limit of say Rs 1 Lakhs. Example: Chemotherapy for advanced germ cell tumours, some paediatric leukaemias and solid tumours.</td>
<td>Ensure free or subsidized treatment for individual patients through government or other charity support if it produces remarkable cure rates (&gt;20% improvement in long term cure over the cheaper or affordable option) with some maximum limit of say Rs 3 Lakhs. Specific clinical contexts to be defined based on clinical results available in year 2012.</td>
</tr>
<tr>
<td>Curative Treatment:</td>
<td>Recommend a Primary modality e.g. Surgery versus Radiotherapy (RT) or Combination/Adjuvant therapy e.g. RT versus Chemo RT; Regimen A versus B etc, in the following contexts &gt;5% superiority in 5 year survival OR &gt;15% superiority in 5 year Disease free survival OR &gt;25% superiority in major Quality of Life (QOL) endpoints</td>
<td>Curative Treatment:</td>
</tr>
<tr>
<td>Palliative Care:</td>
<td>Strongly recommend if sustained improvement in QOL with minimum toxicity and cost.</td>
<td>Palliative Care:</td>
</tr>
<tr>
<td>Severe visceral pain: Morphine for &gt;80% patients</td>
<td>Severe bone mets pain: RT for &gt;80% patients.</td>
<td>Severe visceral pain: Morphine for &gt;90% patients.</td>
</tr>
<tr>
<td>Bisphosphonates: If high risk of pathological fracture</td>
<td>Home care: Initiate in few areas.</td>
<td>Bisphosphonates for &gt;90% cases with lytic bone metastasis</td>
</tr>
</tbody>
</table>

will generally be done in government funded centres, it is important to bring the industry partner on board at the earliest for refining and marketing the product. The department of atomic energy has established a very successful model for the development of indigenous telecobalt unit (Bhabhatron), which is now being marketed by the industry (Panacea Medical Technologies Pvt. Ltd, Bangalore). The first Bhabhatron was successfully installed in 2005 and is in clinical use at the Advanced Centre for Treatment Research & Education (ACTREC), Tata Memorial Centre. Several other units of Bhabhatron are likely to be installed in other centres in the near future. The major cost advantage of this indigenous unit over the imported machines can enable us to meet the huge demand in a much shorter period of time. While the present thrust is on affordable and high quality telecobalt unit, the country also needs more affordable linear accelerators, treatment planning equipment and Brachytherapy machines. The new version of the indigenous low energy Linear Accelerator developed by SAMEER, Department of Electronics, IIT Mumbai campus, has recently been installed at Wardha. The ‘Apex Committee for the Development Programme of Cancer Institutions

Table 5: Upgrading treatment facilities and improving human resources

<table>
<thead>
<tr>
<th>Treatment modality</th>
<th>Short term targets (for next 5 years)</th>
<th>Long term targets (subsequent 5 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiotherapy</td>
<td>Increase wider availability of equipment and treatment through 1. Indigenous development of affordable Telecobalt, Linac, Brachytherapy, Simulator and imaging equipment 2. Sharing of resources between 4 districts (including RCCs) Treatment Planning, dosimetry, Tele-radiology and remote diagnostics: by Tele Link (Onco-net or Anu-Net). 3. System of patient referral to larger centres for HDR Brachytherapy or LINAC treatment, preferably with involvement of Oncologist and Physicist from the peripheral centre visiting this referral centre weekly or monthly. 4. Independent Resources: 1 Telecobalt and LDR intracavitary for every populous district 5. Training of more oncologists, physicists &amp; technicians and improving quality of training</td>
<td>Increase wider availability of equipment and treatment through 1. Indigenous development of affordable advanced radiotherapy and imaging equipment and generating revenues from royalty 2. Sharing of resources between 3 districts (including RCCs) Treatment Planning, dosimetry, Tele-radiology and remote diagnostics: by Tele Link (Onco-net or Anu-Net). 3. System of patient referral to larger centres for HDR Brachytherapy or LINAC treatment, with involvement of Oncologist and Physicist from the peripheral centre visiting this referral centre once weekly. 4. Independent Resources: 1 Telecobalt and LDR intracavitary for every district 5. Training of more oncologists, physicists &amp; technicians and improving quality of training</td>
</tr>
<tr>
<td>Surgery</td>
<td>Ensure good quality surgery (negative margins in &gt;75% cases and &lt;7% serious complication rates) is done in different centres, the number of which will depend upon the complexity of surgery and infrastructure required. 1. Adequate MRM in each district (Criteria: &gt;9 nodes dissected &amp; adequate flaps in &gt;75% cases) 2. Quality BCT in each RCC (Criteria: -ve margins in &gt;90%; poor cosmesis in &lt;30%) 3. H &amp; N: Major resection + Reconstruction in each RCC 4. Cervix: Adequate Werthiem’s in each RCC 5. GI: Adequate colorectal surgery: each RCC 6. Oesophagus/ Lung: Curative Surgery in 10 centres 7. Bone Soft tissue surgery + Prosthesis: 4 centres</td>
<td>Ensure good quality surgery (negative margins in &gt;90% cases and &lt;5% serious complication rates) is done in different centres, the number of which will depend upon the complexity of surgery and infrastructure required. 1. Breast: Quality BCT in 50% of the districts (Criteria: -ve margins in &gt;90%; poor cosmesis in &lt;30%) 2. H &amp; N: Major resection + Reconstruction in each RCC 3. Cervix: Adequate Werthiem’s in each RCC 4. GI: Adequate colorectal surgery: each RCC 5. Oesophagus/ Lung: Curative Surgery in 15 centres 6. Bone Soft tissue surgery + Prosthesis: 7 centres</td>
</tr>
</tbody>
</table>
in India set up by the Department of Atomic Energy is coordinating the developmental of several other Brachytherapy and Teletherapy planning and treatment delivery equipments.

**CHALLENGES FOR THE NCCP**

1. The immediate and most important task for the NCCP is to generate reliable mortality data and some morbidity data for common cancers in the cross section of the Indian population. Like most industrialised nations we should aim to use the more reliable data on cancer mortality and morbidity to judge the cumulative effect of any preventive or therapeutic intervention in the population.[11]

2. Establish a robust system for monitoring pattern of carcinogenic exposure and changes in the composition of carcinogens with special emphasis on Tobacco, industrial and environmental carcinogens. Apex national reference laboratories for Tobacco, Industrial and Viral carcinogens should be identified, strengthened and co-opted into NCCP.

3. Identify the high risk population using research into behavioural, occupational, and socio-economic profiling. For the purpose of NCCP, biological profiling (e.g. host genotype, HPV etc) should be attempted only if other methods are unable to identify this ‘high risk population’ or the methods of biological profiling are likely to be more cost effective.

4. Through research, identify simple, affordable and effective screening methods for high risk population for our common cancers.

5. Devise and test tailored behavioural interventions for primary prevention.

6. If the standard of care treatment in the west for a particular cancer is not affordable or logistically feasible for ‘universal application’ in India, build consensus for the minimum acceptable standards of care, considering affordability by the masses or the government and the feasibility of its administration [Table 4].

7. If the consensus minimum accepted standard of care is quite different from the standard of care in the west (e.g. CAF versus Taxanes for breast cancer; radiotherapy versus chemo-radiotherapy for all advanced head and neck cancers), NCCP should initiate or support large and pragmatic multi-centric clinical trials in the Indian community setting comparing compliance, toxicity and efficacy. These parameters in the Indian community and typical government hospital setting may be quite different than what is reported in western or even Indian clinical trial setting. For example we need to ensure that the survival benefit of concurrent chemo-radiotherapy in better nourished and well looked after head and neck cancer patients in the west is not being more than offset by the risk of additional fatal toxicity in our malnourished and dehydrated patients undergoing treatment in a typical government cancer set up and then going back to their communities where they have little health support. Till the time we are able to find resources to improve the general health care set up and supportive facilities, governmental funding for ‘western standard of care’ regimens which are more effective in trial setting but also more toxic and expensive may need some introspection.

8. Since it will not be feasible for the country to adopt many of the ‘western standard of care’ treatments for universal application, NCCP should promote pragmatic or novel research for identifying treatment approaches that are at least equivalent or superior in efficacy, or have better compliance and affordability.

9. Treatments that are cost effective and have undergone rigorous clinical testing in trial and community setting should be considered for universal application through governmental support.

10. Treatments that have major curative potential such as chemotherapy for some childhood malignancies and germ cell tumours should also be considered for universal application through governmental support or alternative financing schemes or through NGO support.

11. A model for realistic yet holistic care beyond morphine should be developed for more advanced incurable cancers and then replicated in all parts of the country.

12. The RCCs, Medical Colleges and District Programmes should be strengthened with necessary equipment and training of manpower to fulfil the objectives of the NCCP in a mission mode.

13. Rigorous and regular audit of performance at all levels of planning and implementation of the NCCP programmes.

**CONCLUSION**

Cancer undoubtedly is becoming an important public health issue and to tackle it we need immediate and major inputs from various agencies. In decades to come, the health of the nation would become a major determinant of our human and economic wealth and the pace at which we will achieve our rightful place in the world order. Though cancer is not in the United Nations ‘Millennium Development Goal’ health agenda, based on the emerging trend, WHO has predicted that by the year 2020, almost 70% of the world’s 20 million cancers patients will be in the developing nations. In our march towards becoming a healthier, wealthier and pre-eminent nation, coordinated and need based research for understanding the threats to the nation from chronic diseases such as cancer and ways to counter such threats will assume increasing importance. NCCP has started on the right note but to achieve its objectives we need major leads from timely and innovative research which can be implemented across this vast nation in a cost effective manner. I have estimated that the total annual budgetary allocation for cancer care and research from the In-
dian Government is perhaps less than 1% of the 6 Billion US Dollars research and administration budget of the US National Cancer Institute for the year 2007. While it may take us several decades to match such budgetary allocations for cancer research, even in an under funded national cancer control programme such as ours, research is not a luxury and perhaps more crucial for success than in these affluent nations.

REFERENCES

2. http://mohfw.nic.in/kk/95/9590e01.htm accessed 10.12.05
5. http://www.canceratlasindia.org accessed on 11.12.05
11. http://cancercontrolplanet.cancer.gov accessed on 23.12.05

These are the personal views of the author and not necessarily of his institute or the National Cancer Control Programme.