JUNE 1998 VOLUME 4 NUMBER 3 ISSN: 0965-0288

Effective Health Care

Bulletin on the effectiveness of health service interventions for decision makers

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Management of lung cancer

- Lung cancer is the third most common cause of death in the UK. The disease progresses rapidly and the prognosis is usually poor; around 80% of patients die within a year of diagnosis.
- Since cigarette smoking is responsible for about 90% of cases of lung cancer, action against smoking should be the primary focus of efforts to improve outcomes. A range of co-ordinated interventions to reduce smoking should be provided at both local and national levels.
- Palliative care should be an integral part of patient management from the outset. All patients should be offered accurate information about their disease and its management.
- A range of interventions can be used to control symptoms and improve quality of life. These include not only anti-cancer treatments such as radiotherapy and chemotherapy, but also pain relief and psycho-educational interventions such as breathing re-training.
- As treatment options are normally determined by tumour type, diagnosis should include identification of tumour type except when this would not influence management. Decisions about treatment should take account of the patient's fitness, not age.
- Surgery offers a chance of long-term survival for a minority of patients with non-small cell lung cancer and every effort should be made to identify those who might benefit. Tumour stage must be adequately assessed before surgery to reduce the risk of inappropriate operations.
- Systems should be established to allow CHART (continuous hyperfractionated accelerated radiotherapy) to be offered to suitable patients. This will require that radiotherapy is available at weekends.
- Chemotherapy using established combinations of drugs should normally be offered to patients with small cell lung cancer. Chemotherapy may be appropriate for patients with non-small cell lung cancer but requires further evaluation.

The contents of this bulletin are likely to be valid for around one year, by which time significant new research evidence may have become available.

A. Background

A.1 Incidence and prognosis: Lung cancer (which includes cancer of the trachea and bronchi) is the third most common cause of death in the UK. It is responsible for almost a quarter of all cancer mortality, with 30,803 deaths in England and Wales in 1996, 4,237 in Scotland, and 768 in Northern Ireland (1995). The 1996 death rate per 100,000 population (England and Wales) was 77.7 for men and 41.8 for women.[1]

The prognosis is generally poor; about 80% of patients die within a year of diagnosis[2] and 5.5% survive 5 years.[3] This is due in part to the nature of the disease, which tends to progress rapidly, and also to the nature of the patient group. Most people with lung cancer are not only elderly (median age, 72 years)[1] but less fit than their contemporaries, often suffering from smoking-related illnesses such as cardiovascular disease and chronic obstructive lung disease. Fitter individuals with early-stage cancers which can be treated by surgery have a much better prognosis; published reports suggest that two-thirds of these patients may survive for 5 years.[4]

A.2 Improving outcomes in lung cancer: In order to improve the standard of care for patients with lung cancer, the Department of Health has published guidance for commissioners of services: *Improving Outcomes in Lung Cancer: The Manual*.[5] This bulletin is based on research carried out to inform the guidance which is published in a related document: *Improving Outcomes in Lung Cancer: The Research Evidence*.[6] These follow similar publications on breast and colorectal cancers. All may be obtained free of charge by calling the NHS Response Line on 0541 555 455.

The research evidence outlined in this bulletin is based on a series of interlinked systematic reviews. Further information on the review process, including the specific questions considered, is given in *Improving Outcomes in Lung Cancer: The Research Evidence*.[6]

B. Causes and prevention

B.1 Smoking: 90% of lung cancer deaths are estimated to be caused by smoking, 5% by radon, and 2% by asbestos.[7,8] The risk of lung cancer among current smokers is about fifteen times that for those who have never smoked; it is highest for heavy smokers and increases with more years of smoking.

The prevalence of smoking had been decreasing since about 1970 but has increased since 1994, particularly among young people and women under 35.[9]

Smoking prevention is the only measure that can be expected to have a substantial impact on lung cancer incidence and mortality. There is good evidence that interventions to help people stop smoking, provided at both local and national levels, can be highly cost-effective.[10–12]

Effective interventions range from mass media campaigns to individual advice and support. These have been summarised in the most recent *Effectiveness Matters*[13] (copies available from the NHS Centre for Reviews and Dissemination). Quit rates achieved by selected interventions are given in Table 1.

The effectiveness of interventions to prevent the uptake of cigarette smoking will be the subject of a forthcoming issue of *Effective Health Care*.

B.2 Nutrition: Higher consumption of fruit and vegetables (in particular, green vegetables and carrots) may halve the risk of lung cancer.[14–17] The protective mechanism is not known. Supplements of vitamins thought to confer protection have not been shown to produce the same benefits; indeed, intervention trials have found increases in lung cancer incidence and mortality in smokers who take beta-carotene supplements.[18,19]

B.3 Radon: Radon is a naturally-occurring odourless radioactive gas which emanates from some types of rock. People who live in houses in which radon levels are high are more likely to develop lung cancer.[8]

A meta-analysis of case-control studies which included 4,263 lung cancer cases and 6,612 controls found a significant dose-related increase in the risk of lung cancer with increasing exposure to radon ($p=0.03$).[20] There is synergy between radon and cigarette smoke; smokers exposed to radon are at particularly high risk of developing lung cancer ($p=0.02$).[21]

Radon levels vary widely across Britain.[22] Indoor radon can be reduced by sealing buildings so that air cannot enter from the soil and/or increasing ventilation to the lower levels of the building.[23] Such work is cost-effective where radon levels are high; figures of $6,100 and $35,000 per life year saved have been calculated for homes with levels of >800 and >300 Bequerel/m^3, respectively (US

Table 1 Effective interventions to help people stop smoking

Type of intervention	Quit rate
Brief advice from health professionals	2%
Nicotine replacement plus advice, support or counselling	12%
10 minutes (minimum) prenatal counselling for pregnant women, plus written material tailored to pregnancy	15%

figures based on mid-1980s data).[24] Information about all aspects of radon in the UK and appropriate action for risk reduction is available from the National Radiological Protection Board (telephone 01235 831600).

B.4 Asbestos and other environmental carcinogens: Asbestos is the most common occupation-related cause of lung cancer; again, the risk increases with cumulative exposure.[25] Building workers, plumbers, gas fitters, carpenters, electricians, metal plate workers and fitters form the largest high-risk groups.[26]

Other substances known or believed to cause lung cancer include acetaldehyde, acrylonitrile, arsenic, beryllium, bis(chloro-methyl)ether, cadmium, chromium, formaldehyde, nickel, polycyclic aromatic compounds (in diesel exhaust), silica, synthetic fibres, vinyl chloride, and welding fumes.[27]

C. Information for patients

Dealing with lung cancer can involve difficult choices for patients and clinicians. Effective communication is essential to ensure that patients who wish to make informed choices are able to do so, and that their views are respected.

The most common complaint by cancer patients is that they are given too little information.[28] Almost all want accurate information about diagnosis and treatment; such information reduces anxiety even when the news is bad.[29–32]

Some of the most effective types of treatment, in terms of life-expectancy, can cause severe adverse effects (see E.2 and F.1, below). While some patients place great value on the hope of increased survival time, others are more concerned about the quality of their remaining life.[33]

In order to make appropriate choices, patients need accurate information about anticipated effects, both good and bad, of each treatment option. This has additional benefits. Patients who are given information on what they are likely to experience before they undergo treatment are less anxious and express greater satisfaction.[34, 35] Psycho-educational interventions which include information can reduce some adverse effects of treatment.[36, 37]

D. Diagnosis

D.1 Screening and early diagnosis: A systematic review of screening using radiography (x-rays) and/or sputum cytology (examination of cells in sputum produced by coughing) for asymptomatic men at high risk of lung cancer concluded that it was not effective.[38] Three randomised controlled trials (RCTs) including 30,000 male smokers over the age of 45, controlled prospective studies, and case-control studies found no evidence to suggest that screening can reduce lung cancer mortality. Although more surgically treatable tumours and lower case-fatality rates are found with more frequent screening, this is likely to be due to leadtime and length biases. These trials also suggest that delay in diagnosis of lung cancer may have little impact on eventual outcome.

D.2 Diagnostic methods: The aim of diagnosis is both to identify the presence of lung cancer and to determine the tumour type. This information is essential for decision-making about management.

Lung cancer is broadly differentiated into two types which respond differently to different treatment modalities: small cell lung cancer (SCLC) and non-small cell lung cancer (NSCLC). About 80% of patients have non-small cell tumours and 20%, small cell.

Most symptomatic tumours can be seen on x-rays. Histological confirmation is usually achieved using bronchoscopy, which involves introducing a flexible tube into the affected part of the lung and taking samples of tumour cells by brushing, washing, or biopsy. Bronchoscopy can have adverse effects (mortality rate 0.2%) and can be unpleasant for patients.[39, 40] Although tumour type can sometimes be identified from sputum cytology, this method cannot be used to exclude lung cancer because it has a high false-negative rate.[41]

D.3 Staging: Radical treatment, which may substantially increase life-expectancy, is likely to be appropriate only for early-stage tumours. In NSCLC, accurate staging is particularly important for decision-making about surgery. Tumour stage can be assessed by CT scanning and/or sampling lymph nodes around the bronchial tubes (mediastinum). An RCT which compared staging by CT scan with CT plus routine mediastinoscopy (surgical investigation of the mediastinum) revealed that mediastinoscopy did not improve outcomes if the lymph nodes seen on the scan appeared normal.[42]

In SCLC, CT scanning is useful to assess the extent of the disease when thoracic radiotherapy (see F.2, below) is being considered, since this treatment is only appropriate for patients who have limited disease (tumour confined to one side of the chest).[43]

Meta-analysis of 25 published studies shows that metastatic lung cancer (NSCLC or SCLC) can be reliably detected by careful clinical examination using predefined criteria and blood tests; routine CT scanning is not necessary.[44]

E. Treatment of non-small cell lung cancer

Treatment for patients with NSCLC depends on the stage of the disease and the general condition of the patient. Many patients present with advanced/metastatic disease for which palliative interventions are likely to be appropriate (see section G). For those with early stage disease, first-line treatment is normally surgery or radiotherapy.

E.1 Surgery: Surgery is regarded as the only treatment that offers the hope of cure in NSCLC. The most effective types of operation involve opening the chest (thoracotomy) and removing a lung (pneumonectomy) or a lobe of a lung (lobectomy).[45]

Patients need to be carefully selected so that those who are likely to benefit are offered surgery. Surgery is only appropriate for patients who are relatively fit, who have adequate respiratory capacity, and who have early-stage, histologically confirmed, NSCLC. There is no evidence that selection should be based on the patient's age.[46] It appears that these conditions are frequently not met in the UK; in particular, many surgeons fail to ensure that patients are adequately staged.[47] Nevertheless, the rate of surgery in Britain is lower than in most other developed countries, which suggests that some who might benefit are not offered this treatment.

A trial in 1963[48] found that surgery was more effective than radiotherapy but there are no recent reliable estimates of the increase in survival which may be attributed to surgery. Observational evidence from a US study suggests that five year survival for patients with stage I disease who undergo surgery is 70%, compared with 10% for those who do not.[49] However, outcomes for patients who undergo surgery in NHS hospitals are poorer than this, if only because most have later stage tumours; audit data from Yorkshire suggest that the overall 5 year survival rate is 27%.[2]

Surgery for lung cancer carries a 5% overall operative mortality risk and causes significant morbidity. 10% of patients have major life-threatening complications and 50% have persistent incisional pain for 1–4 years.[50] Quality of life is temporarily impaired, returning to pre-operative baseline after 6 months.[51]

Almost 11% of thoracotomies in the UK are 'open and close'; the chest is cut open but the tumour is not removed.[52] This usually occurs when the disease is too extensive to be treated by surgery (i.e. the stage of the tumour has not been accurately assessed) and implies avoidable morbidity and wasted resources.[53] Considerably lower rates can be achieved: for example, a rate of 4% was reported in a Canadian trial.[42]

E.2 Radiotherapy: Patients who are less fit, or whose tumour is too extensive for surgery but do not have distant metastases, are likely to benefit from radiotherapy. Medium-term survival appears to be improved by higher doses of radiotherapy but the risk of serious adverse effects also increases.[43]

The radiotherapy schedule most often used for radical treatment (60 Gy in 30 fractions) continues for 6 weeks. This type of conventional radiotherapy has been compared in an RCT with CHART (continuous hyperfractionated accelerated radiation therapy), in which a similar total dose is given in small fractions 3 times daily for 12 consecutive days. CHART was found to reduce mortality (hazard ratio 0.76; 95% CI: 0.63 to 0.92; p=0.004). After 2 years, 29% of CHART-treated patients were alive, versus 20% of those treated conventionally.[54, 55]

Adjuvant radiotherapy, given before or after surgery, has not been shown to improve outcomes; indeed, it may be harmful.[56, 57] A meta-analysis of data from RCTs of post-operative radiotherapy found that it led to a 7% reduction in survival at 2 years ($p<0.0003$).[58]

E.3 Chemotherapy: A meta-analysis of outcomes for 9,387 patients in 52 RCTs shows that modern cisplatin-based chemotherapy leads to slight improvements in survival, compared with no chemotherapy.[59] In early NSCLC, adjuvant chemotherapy offers an absolute survival benefit of 4% (95% CI: 1% to 7%) at 2 years; i.e. 4% more people are likely to be alive after 2 years if they undergo chemotherapy in addition to surgery or radiotherapy. At 5 years, the absolute survival benefit drops to 2% (95% CI: 1% to 4%).

The value of chemotherapy before surgery is uncertain, although two small RCTs have suggested that it may improve survival.[60–62] This issue is being addressed in a major UK trial.[63]

Various new-generation drugs have been developed which appear promising and may improve outcomes. However, there is as yet no clear evidence from published RCTs that these drugs are more effective than established platinum-based combinations.[64, 65] Further research is required to establish their cost-effectiveness and their place in routine practice.

F. Treatment of small cell lung cancer

The first-line treatment for SCLC is normally chemotherapy. Radiotherapy may be used in addition to chemotherapy. An RCT showed that the addition of surgery to chemotherapy did not improve outcomes.[66]

F.1 Chemotherapy: Before the introduction of combination chemotherapy, most patients with SCLC survived for 2–4 months. Since 1980, median survival times reported in trials have been around 12 months.[67, 68] Outside the context of trials, patients treated with chemotherapy in England live for a median of about 7 months.[2]

Combination chemotherapy leads to better outcomes than single-agent treatment.[67] In particular, oral etoposide leads to more toxicity and worse survival than standard combination chemotherapy.[69, 70]

The most frequently studied combination is cyclophosphamide/doxorubicin/vincristine (CAV), which can induce responses and temporary remission from symptoms in 80% to 90% of cases. Cisplatin/etoposide (PE) produces similar benefits.[71] 3 to 6 cycles of chemotherapy may be given.[72–74] In general, more effective regimens tend to be more toxic, so the greatest improvements in survival time are likely to be accompanied by worse adverse effects; but there is marked individual variability in the impact of chemotherapy.[72, 75–79]

No published RCTs compare CAV or EP with 'new generation' agents (such as gemcitabine, taxanes, vinorelbine, or navelbine) alone or in combination, for first-line treatment of SCLC. Reports of uncontrolled phase II trials cannot be regarded as reliable.

Dose-intensification, achieved either by increasing doses or by reducing the time-interval between cycles of chemotherapy, does not offer any benefit.[67, 80] Meta-analysis of results of 60 published studies shows little correlation between dose-intensity and survival.[81]

Up to 10% of patients in some trials have died after chemotherapy, usually 1 to 2 weeks after treatment began.[82–84] Patients at particularly high risk of early death are those with poor performance status, extensive disease, white blood cell count >10,000/mm^3 and high alkaline phosphatase, high blood urea or low serum albumin.[83] Age does not appear to be a significant independent risk factor.[85]

Nausea and vomiting peak for about 3 days with each cycle of chemotherapy and can cause marked impairment of quality of life.[73, 75, 78, 86–88] A meta-analysis of 30 RCTs shows that 5-HT^3 receptor antagonists are significantly more effective than conventional anti-emetics for prophylaxis of acute vomiting caused by cytotoxic chemotherapy, whether or not this includes particularly emetogenic drugs such as cisplatin.[89]

F.2 Radiotherapy: Patients with SCLC who respond to chemotherapy may also benefit from radiotherapy. This can be given both to the chest, to improve local tumour control, and to the brain, to reduce the risk of brain metastases (prophylactic cranial irradiation, or PCI).

Two meta-analyses of RCTs have confirmed that the addition of thoracic radiotherapy to chemotherapy can increase survival time in patients with limited SCLC.[90, 91] One, using individual data from 2,140 patients in 13 RCTs, found that the relative risk of death in patients who had combined radio- and chemotherapy, compared with those who had chemotherapy only, was 0.86 (95% CI: 0.78 to 0.94; p=0.001). This represents an absolute overall survival benefit of 5.4 $\pm$1.4%: from about 10% of patients alive after 3 years with chemotherapy alone, to 15% after combined therapy. There was no evidence of benefit for patients over 70 years old but the confidence intervals are wide (relative risk 1.07: 0.70 to 1.64).[90] Thoracic radiotherapy leads to better tumour control within the chest but more early treatment-related deaths (odds ratio 2.54, 95% CI: 1.90 to 3.18; p<0.01).[91] However, these early deaths are counterbalanced by the improved longer term survival.[90, 91]

PCI can significantly enhance survival and reduce the risk of brain metastases without compromising quality of life.[92, 93] A meta-analysis of individual data from RCTs found that PCI for patients in complete remission after chemotherapy reduced the risk of death, relative to those who did not have PCI, to 0.84 (95% CI: 0.73 to 0.97; p=0.01). This represents a 5.4% absolute improvement in the 3-year survival rate (21% versus 15%). Radiotherapy doses ranged from 8 Gy in one fraction to 40 Gy in 20 fractions; there appears to be a dose-response relationship in the degree of protection from brain metastases (p=0.02).[94]

G. Management of advanced disease

Advanced lung cancer causes a large number of distressing symptoms. Over three-quarters of patients suffer breathlessness and cough, which can be severe and disabling. Weight loss, weakness/malaise, chest and bone pain, haemoptysis (coughing up blood), and anxiety are also common. Palliation – reducing the severity of symptoms – is the main aim of treatment for most patients, and should be an integral part of care for all patients with lung cancer.[95–98]

G.1 Radiotherapy: Radiotherapy can palliate symptoms in 70% of patients with advanced lung cancer.[99] It is appropriate for patients with advanced NSCLC and may reduce symptoms in patients with SCLC for whom chemotherapy is unacceptable or inappropriate.

Chest symptoms may be relieved with minimal adverse effects using a single fraction of radiotherapy.[100] A series of linked RCTs comparing the effectiveness of 4 radiotherapy schedules found few differences in outcomes. Although a higher dose

(39 Gy) may improve survival slightly in better-prognosis patients, symptom control is less rapid and adverse effects are greater.[100–102]

Radiotherapy offers substantial relief for over 40% of patients with pain due to bone metastases. Meta-analysis of results of RCTs reveal little discernible difference in effectiveness between different fractionation schedules or doses.[103]

G.2 Chemotherapy: Chemotherapy can reduce the severity of several symptoms concurrently in patients who respond. It is appropriate as first-line treatment for patients who present with extensive SCLC. Its role in the treatment of advanced NSCLC is less clear; while it produces an increase of around 6 weeks in life expectancy (an absolute improvement in survival of 10% (95% CI: 5% to 15%) at 1 year)[59], the overall balance of benefits to adverse effects, and the cost-effectiveness, is not clear. These issues are currently being addressed in the Big Lung Trial.[63]

Quality of life has been evaluated in some studies of chemotherapy for NSCLC but the value of the information is limited for a number of reasons:

- Because of the high attrition rates in these studies, information on quality of life is predominantly based on healthier patients. There is a lack of data from patients who die early and are more likely to have poor quality of life. Overall measures will therefore tend to overestimate quality of life.[104, 105]
- Most reports lack detail and do not include patients' assessments or measures of day-to-day changes.[106]
- Studies which report on symptom control usually include only clinicians' reports, which may not accurately reflect patients' experience.[107]
- The symptoms assessed may not be those that cause the greatest distress: fatigue, one of the most common symptoms of lung cancer, is rarely considered.[95, 104, 108, 109]

Nevertheless, it appears that chemotherapy can offer at least partial relief from some symptoms.[110–115] The median duration of palliation associated with 3 treatment cycles ranges from 10 to 24 weeks but the balance between symptom palliation and adverse effects varies widely between individuals.[116] Any benefits are usually apparent after the first cycle of chemotherapy and almost always by the third.[113]

G.3 Management of breathlessness: Breathlessness due to lung cancer can be life-limiting and sometimes, life-threatening. Uncontrolled breathlessness can be costly to the health service: a study of 122 lung cancer patients presenting with breathlessness at the emergency department of a cancer centre found that 60% were admitted to hospital.[117] A variety of approaches to treatment are used, ranging from behavioural interventions, through drug treatment, to interventions to physically remove tumour from the airways.

Counselling and breathing re-training by nurses can reduce anxiety and enhance patients' ability to cope with the effects of breathlessness. RCTs have shown that this approach can significantly reduce distress ratings and improve physical functioning in patients with lung cancer.[118, 119] These results are consistent with a substantial literature showing that psycho-educational interventions can improve both physical and psychological well-being of cancer patients.[36]

Pharmacological interventions for breathlessness include opioids, anxiolytics and anaesthetics, but evidence for their effectiveness is poor.[120–123]

Breathlessness due to pleural effusion is treated by surgery but there is no clear evidence on the most effective method of management.[124–134]

When breathlessness is caused by obstruction of main airways, it is normally treated with external beam radiotherapy. If this is not possible, intraluminal brachytherapy (IBT), which involves placing radioactive material directly on, or near to, the tumour, may be used. Published evidence suggests that IBT should not be used for patients who can tolerate conventional radiotherapy.[135] IBT can control cough, haemoptysis and breathlessness in about 75% of patients but it can also cause serious adverse effects, including fatal haemoptysis in perhaps 20% of patients.[136–145]

Other methods of opening the airways include laser treatment, cryotherapy and stent insertion. All have been reported to produce rapid improvements but there have been no comparative trials.

G.4 Pain control: Chest pain is a common symptom in lung cancer which becomes more severe as the disease progresses.[95, 96, 146] About half of patients undergoing treatment for lung cancer report pain; this rises to 80% to 90% of those admitted to palliative care units.[147]

Effective pain relief can be achieved for 80% to 90% of patients with cancer using the World Health Organisation 3-step analgesic ladder.[148, 149] Pain due to lung cancer can be relieved with drugs (particularly opioids) and radiotherapy; psycho-educational and physical interventions may also be helpful.[150]

Despite the availability of effective methods of pain control, there is evidence that sub-optimal pain control is common in advanced cancer patients[151, 152] and clinicians frequently fail to recognize that pain is inadequately managed.[153]

G.5 Palliative care: A prospective study of patients treated for lung cancer in Yorkshire suggests that many patients obtain inadequate palliation.[96] Few patients requiring supportive care receive initial hospice or palliative care referral.[99]

Patients dying of cancer with no specific palliative care may suffer severe unrelieved symptoms, particularly pain; they may have unmet practical, social and emotional needs; and they may suffer both because of poor co-ordination of services and poor communication by health professionals.[154–165] In hospital, staff have been observed to withdraw from patients when curative interventions were no longer being administered, and to pay little attention to their symptoms, emotional needs or needs for care.[158]

Specialist palliative care can improve symptom control, patient and carer satisfaction with care, involvement in the process of care, and in one study, survival. However, a specialist symptom control team was not found to be adequate for controlling breathlessness.[154]

The majority of cancer patients prefer to be cared for at home, but fewer than one third actually die at home.[166–168] An American RCT comparing home nursing care with conventional physician-led care found that lung cancer patients who were nursed at home had less distress and maintained greater independence than those who received physician-led care.[169] Outside the context of trials, poor symptom control often means that people with cancer are unable to spend their remaining life at home; currently, only half receive support from a palliative care team or specialist nurse.[170]

Provision of specialist palliative care can enable patients to spend more time at home and less time in acute hospital beds, which can reduce NHS costs. However, while home care enables patients to remain independent and out of hospital for longer, there is some evidence that in-patient palliative care may offer better pain control.[170]

Palliative care in the community can be very fragmented; up to 25 different paid carers may visit a person's home during the course of a terminal illness.[170] Nurse co-ordinators can improve patients' access to appropriate services so that fewer inpatient days and nurse home visits are required; this can reduce NHS costs.[171]

H. Cost-effectiveness

There is little reliable information on the cost-effectiveness of management options for patients with lung cancer. Although there is considerable concern about the potential for large increases in cost of treatment, particularly with increasing use of chemotherapy for NSCLC, most published studies of cost-effectiveness are based on assumptions which may not be generalisable to the UK.[172–177] In one area, however, there is information derived from a UK-based RCT: the comparison between conventional radical radiotherapy and CHART (see E.2, above).

H.1 CHART: Data from the CHART trial suggest that it can be highly cost-effective. Cost data were collected for 248 representative patients with lung cancer and included radiotherapy, hospital services (in-patient admissions and out-patient visits), hospital transport, community services, and patient travel. The overall costs per patient were £2,484 for CHART and £1,786 for conventional treatment, a difference of £698 (95% CI: £392–£1,003; $p<0.001$).[178]

The additional cost of CHART has been estimated at about £2,500 (£1,100–£3,250) per disease-free life year. This calculation, based on interim results, assumed a 2 year survival differential of 10% (25% versus 15%) and a cost differential of £900.[179] The actual 2 year survival differential of 9% (29% versus 20%)[55] and cost differential of £700 would suggest a slightly lower cost per life-year.[178]

I. Recommendations

The National Cancer Guidance Group identified six key recommendations.[5] These are shown below. There is little research evidence on some issues considered to be crucial by the Group, notably the structure of services and the team approach. This is based largely on the logic of a multimodality approach to cancer treatment and the importance of co-ordination and integration of services.

- **Prevention**
  Action against smoking should be the primary focus of efforts to improve outcomes in lung cancer. A range of co-ordinated interventions to reduce the uptake of smoking and promote quitting should be provided at local and national levels. Health professionals should be trained in the use of effective interventions and encouraged to offer them.

- **Access to a lung cancer team**
  The management of patients with lung cancer should be the responsibility of specialist multiprofessional teams. Systems need to be established to ensure that all patients suspected of having lung cancer are assessed by the local lung cancer team, which may operate over more than one hospital. Patients should have quick access to appropriate team members throughout the course of their illness.

- **The palliative approach**
  Palliative care should be an integral part of patient management from the outset. It should be the responsibility of a

multiprofessional team which has close links with the lung cancer team, sharing at least one member in common.

- **Selection of patients for radical treatment**
  Radical treatment – notably surgery – offers the chance of long term survival for a minority of lung cancer patients and every effort should be made to identify those who might benefit. Detailed information on cancer type and stage must be obtained promptly for all patients being considered for radical treatment.

- **Radiotherapy using CHART**
  Systems should be established to allow CHART (continuous hyperfractionated accelerated radiotherapy) to be offered to patients with inoperable early-stage non-small cell lung cancer. This will require that radiotherapy is available at weekends, on an in-patient or hotel basis.

- **Chemotherapy**
  Chemotherapy using established drugs should be offered to suitable patients with small cell lung cancer. Normally, new chemotherapeutic agents and chemotherapy for patients with non-small cell lung cancer should not be offered outside the context of national RCTs which evaluate costs of treatment and effects on survival and quality of life.

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The Research Team:

This bulletin is based on a series of reviews funded by the Department of Health for the production of guidance on commissioning cancer services. Full details are provided in *Improving Outcomes in Lung Cancer: The Manual* and *The Research Evidence*, published by the NHS Executive. These may be obtained free of charge by calling the NHS Response line on 0541 555 455.

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The bulletin was written and produced by staff at the NHS Centre for Reviews and Dissemination, University of York.

Acknowledgements:

Effective Health Care would like to acknowledge the helpful assistance of the National Cancer Guidance Group chaired by Professor Bob Haward, and members of the editorial group responsible for *Improving Outcomes in Lung Cancer*.

- Bob Haward, University of Leeds
- Fergus Macbeth, Clinical Effectiveness Support Unit (Wales)
- Susan O'Toole, Consultant in Health Policy and Management
- Mike Peake, Pontefract General Infirmary
- Mike Richards, St Thomas' Hospital
- Steve Spiro, The Middlesex Hospital

Effective Health Care would also like to acknowledge the following individuals who commented on the text:

- Phil Ayres, St James' Hospital
- Mark Baker, North Yorkshire Health Authority
- Simon Balmer, Nuffield Institute for Health
- Chris Bradley, Bradford Royal Infirmary
- Alison Evans, University of Leeds
- Ian Hammond, Bedford and Shires Health Care Trust
- Colin Pollock, Wakefield Health Authority
- Stephen Singleton, Northumberland Health Authority
- Colin Waine, Sunderland Health Authority

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The NHS Centre for Reviews and Dissemination is funded by the NHS Executive and the Health Departments of Scotland, Wales and Northern Ireland; a contribution to the Centre is also made by the University of York. The views expressed in this publication are those of the authors and not necessarily those of the NHS Executive or the Health Departments of Scotland, Wales or Northern Ireland.

Printed and bound in Great Britain by Latimer Trend & Company Ltd., Plymouth. Printed on acid-free paper. ISSN: 0965-0288