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Estimation of the additional costs of chemotherapy for patients with advanced non-small cell lung cancer

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Background: A large multicentre randomised trial, the Big Lung Trial, which in part compared supportive care with or without cisplatin-based chemotherapy in patients with advanced non-small cell lung cancer, provided an opportunity to evaluate the impact on the UK National Health Service of the costs incurred with the use of chemotherapy.

Methods: This costing study was based on the retrospective collection of resource use data from hospital records. Case notes from 194 patients (98 chemotherapy + supportive care (C), 96 supportive care alone (NoC)) were inspected in eight centres recruiting the largest numbers of patients into the Big Lung Trial. Quantities were multiplied by fixed unit costs to calculate a total cost for each patient. The main outcome measure was the total cost incurred by the use of secondary care resources (including investigations, chemotherapy, radiotherapy, surgical procedures, inpatient days, outpatient attendances, and hospice inpatient care) in the two groups.

Results: Patients randomised to receive cisplatin-based chemotherapy had an average of 3.4 more inpatient bed days than the mean of 11.9 days for patients randomised to supportive care alone, and more outpatient attendances. NoC patients were more likely to have received palliative radiotherapy. The mean total cost for C patients was £5355 compared with £3595 for the NoC group, difference £1760 (95% CI £781 to £2742). When split, the cost in the C group associated with the administration of chemotherapy was £1233 and non-chemotherapy costs were £4122.

Conclusion: The additional cost of chemotherapy was not offset by a reduction in subsequent costs (as the non-chemotherapy costs were similar), so the survival benefit of about 10 weeks observed in the C group was achieved with the cost of chemotherapy administration.

In 1995 a meta-analysis looking at the possible survival benefits of adding chemotherapy to supportive care for patients with advanced non-small cell lung cancer (NSCLC) found a small but significant survival advantage if the chemotherapy was cisplatin-based.[1] Eight trials were included in the meta-analysis and the median survival with cisplatin-based chemotherapy was 5.5 months compared with 4 months for supportive care alone (hazard ratio (HR) 0.73, 95% CI 0.63 to 0.85). However, the trials comprising the meta-analysis did not assess quality of life or cost effectiveness so the meta-analysis was unable to comment on these aspects.

The Big Lung Trial is a multicentre (predominantly UK) randomised clinical trial designed to confirm the results of the meta-analysis in all treatment settings (surgery, radical radiotherapy, and supportive care) by comparing the primary treatment with or without the addition of three cycles of cisplatin-based regimens (four regimens were allowed). A total of 1394 patients were accrued, including 725 patients in the supportive care setting who were randomised to receive either supportive care only (NoC group) or supportive care plus cisplatin-based chemotherapy (C group). The two groups were compared in terms of overall survival and quality of life. These results have been presented elsewhere[2 3] and showed a significant survival benefit for patients receiving chemotherapy. An additional aim in this setting was to measure the costs of treating advanced NSCLC, particularly as the effects of chemotherapy on survival were predicted to be small. These results are presented here.

METHODS

Based on an expected cost of £5000 per patient in the supportive care group, a sample size of 200 patients was estimated to be sufficient to detect an economically meaningful difference in mean costs of £1000 with 80% power at the 5% significance level. The follow up period was 2 years from randomisation into the Big Lung Trial. In order to reach the target sample size within the allotted project time, the costing study was restricted to those centres that had enrolled the most patients into the supportive care setting of the Big Lung Trial. Nine of these centres were invited to participate and eight agreed, including four teaching trusts (two in London) and four other acute trusts. After obtaining local ethical approval, the centres were visited between August 1999 and December 2000.

The costs incurred at the primary or main hospital were collected by examining each individual patient's hospital records. From the date of randomisation to the Big Lung Trial, the following resources were reviewed: chemotherapy (including the actual chemotherapy agents and concomitant drugs and administration thereof), hospitalisation, radiotherapy, outpatient attendances, surgical procedures, investigations, and hospice inpatient care.

The general approach to counting resource use was to separate all procedures from their accompanying inpatient stay, outpatient attendance, or day case admission. Where necessary, unit costs have been adjusted accordingly. A limitation of the study was that, although some records mentioned transfers to or procedures performed at other hospitals (such as district general hospitals), these transfers were not followed up.

Each patient's resource use was converted to a total cost by multiplying each observed quantity of resource by the corresponding unit cost and summing these products. Unit costs were obtained from standard national sources supplemented by surveying six cancer centres and specialist trusts (table 1). Costs were based on the individual's hospital record

Table 1 Unit costs of major resources

Resource	Unit cost	Source
Hospitalisations (per bed day)		
Medical	£181	A
Oncology	£353	A
Chemotherapy drugs (per mg)		
Cisplatin	£0.34	B
Vindesine	£15.66	B
Mitomycin	£1.85	B
Ifosfamide	£0.02	B
Vinblastine	£1.31	B
Navelbine (vinorelbine)	£2.94	B
Carboplatin	£0.43	B
Gemcitabine	£0.16	B
Administration (per cycle)	£86	A
Concomitant drugs (by regimen)		
CV	£37	B
MIC	£55	B
MVP	£37	B
NP	£37	B
Radiotherapy (baseline costs)		
0–3 fractions	£148	C
4–12 fractions	£270	C
13–23 fractions	£238	C
Radiotherapy (alternative costs)		
0–3 fractions	£244	D
4–12 fractions	£402	D
13–23 fractions	£653	D
Outpatient attendances	£86	A
Investigations		
Chest radiograph	£21	E
Abdominal radiograph	£22	E
CT scan	£155	E
Electrocardiogram	£42	E
Surgical procedures		
Minor thoracic procedure	£273	C
Intermediate thoracic procedure	£559	C
Mouth/throat procedure	£416	C
Stomach or duodenum, diagnostic procedure	£200	C
Insertion of stent	£2272	F
Hospice inpatient care (per bed day)	£58	G
Primary care		
GP contact (surgery)	£20	H
GP contact (home)	£37	H
GP contact (telephone)	£17	H
Practice nurse contact (surgery)	£7	H

CV, cisplatin + vindesine; MIC, mitomycin, ifosfamide + cisplatin; MVP, mitomycin, vinblastine + cisplatin; NP, vinorelbine + cisplatin.
Source codes: A, English Trust Financial Returns 1999/2000, CIPFA; B, British National Formulary, Number 40, September 2000; C, day case episode cost less £50 (estimated day case "hotel costs"), 2000 NHS reference costs; D, 1997/98 Extra-Contractual Referral (ECR) tariff inflated to 1999/2000 pounds using the Heatlh Service Cost Index; E, mean value of responses from trusts surveyed (n = 6) with highest and lowest value trimmed; F, cost of PTCA from 2000 reference costs plus average price of stent, HTA Report; G, English Trust Financial Returns 1999/2000, CIPFA reduced to 32% to adjust for national average contribution of NHS to hospice revenue; H, Unit Costs of Health and Social Care, 2000, PSSRU, University of Kent at Canterbury.

without reliance on assumptions or generalisations. Thus, any impact of complications or other patient-specific factors on costs via days in hospital, dose reductions, or cancellations and the need for surgical procedures or investigations would have been detected.

The statistical significance of differences in the group means was tested using independent samples *t* tests preceded by a test for the equality of variances.

RESULTS

The overall survival result of the supportive care setting of the Big Lung Trial indicated a statistically significant survival benefit to the group allocated to receive chemotherapy (HR 0.77 (95% CI 0.66 to 0.89, p = 0.0006). The median survival for the 364 patients in the C group was 8.0 months compared with 5.7 months for the 361 patients in the NoC group.

Patient sample

The costs study was performed while the main Big Lung Trial was still ongoing, and included all 280 patients who had been entered by eight of the largest accruing centres by the end of December 2000. However, because it was important to collect a complete record of each patient's overall cost to the NHS, only those patients who had died or who were still surviving at 2 years were included in the study. Thus, 38 patients who were still alive but had not yet survived 2 years at the time the costs team visited the centre were excluded. Of the remaining 242 patients, 121 were randomised to receive chemotherapy (C group) and 121 to receive supportive care alone (NoC group). The hospital records of 199 patients were reviewed. The remaining 43 records were irretrievable by hospital staff in advance of the visit. Subsequently, five of the 199 patients turned out to have been wrongly included and were dropped from the sample (two had not completed the follow up period, two were surgical patients, and one was a radical radiotherapy patient). The full sample therefore comprised 194 patients, 98 (51%) in the C group and 96 (49%) in the NoC group. Only nine patients (4.6%: four C, five NoC) were alive 2 years after randomisation.

The pretreatment characteristics of the patients in the costing study were compared with all the other patients in the supportive setting of the Big Lung Trial (table 2). The only significant difference was in the distribution of patients among the chemotherapy regimens chosen at the centres involved, with a higher percentage of the patients in the costing study receiving the cisplatin and vindesine (CV) and mitomycin, ifosfamide and cisplatin (MIC) regimens and fewer receiving the mitomycin, vinblastine and cisplatin (MVP) and vinorelbine and cisplatin (NP) regimens.

Resource use

Resource use is summarised in table 3 and described below.

Admissions to hospital

Dates of admission and discharge were used to calculate the number of bed days for each patient. Bed days were categorised by the type of ward. Most inpatient stays were on a general medical ward, although some patients were admitted to an oncology ward for the administration of chemotherapy. Eight patients had stays in other wards including surgery, radiotherapy, coronary care, or neurosurgery.

For 16 patients a date of admission was recorded with no associated discharge date. In order to impute a length of stay for these admissions, two different types of stays were defined. If chemotherapy was administered within 4 days of admission, the stay was considered to be for chemotherapy. All other admissions were defined as non-chemotherapy. Using the records with complete hospital admission data, mean lengths of stay of 2.5 days for chemotherapy and 9.0 days for non-chemotherapy admissions were imputed.

Another two patients had inpatient stays that were thought to be unreliable (105 days on an oncology ward and 293 days on a medical ward). For one patient this error was corrected when cross checked with other data. For the other patient it was assumed that the recorded admission and discharge dates referred to two different non-chemotherapy stays and that each had a mean length of stay of 9 days.

The chemotherapy patients had an average of 1.46 more inpatient admissions (2.73 *v* 1.27; independent samples *t* test $p<0.001$). Comparing the number of non-chemotherapy stays, the differences between the groups were not statistically significant (p = 0.542). The number of hospital admissions for non-chemotherapy stays was therefore similar between the two groups and there were additional admissions for the administration of chemotherapy for chemotherapy patients.

Table 2 Comparison of pretreatment characteristics of patients entered into the supportive care setting of the Big Lung Trial

	In costing study		Not in costing study	
	C group (n = 98)	NoC group (n = 96)	C group (n = 266)	NoC group (n = 265)
Age (years)				
Range	43–86	36–87	42–81	40–84
Median	65	65	65	65
Sex				
Male	70 (71%)	67 (70%)	205 (77%)	193 (73%)
Female	28 (29%)	29 (30%)	61 (23%)	72 (27%)
Performance status				
0	21 (21%)	23 (24%)	58 (22%)	65 (25%)
1	55 (56%)	47 (49%)	150 (56%)	144 (54%)
2	21 (21%)	25 (26%)	51 (19%)	50 (19%)
3	1 (1%)	1 (1%)	7 (3%)	6 (2%)
Chemotherapy regimen				
CV	8 (8%)	9 (9%)	8 (3%)	9 (3%)
MIC	45 (46%)	38 (40%)	82 (31%)	83 (31%)
MVP	32 (33%)	31 (32%)	121 (45%)	120 (45%)
NP	13 (13%)	18 (19%)	55 (21%)	53 (20%)
Histology				
Squamous	49 (50%)	53 (55%)	145 (55%)	132 (50%)
Adenocarcinoma	30 (31%)	23 (24%)	50 (19%)	66 (25%)
Other NSCLC	19 (19%)	20 (21%)	71 (27%)	67 (25%)
Stage				
I	1 (1%)	3 (3%)	5 (2%)	3 (1%)
II	5 (5%)	1 (1%)	9 (3%)	11 (4%)
IIIa	18 (18%)	20 (21%)	49 (18%)	67 (25%)
IIIb	39 (40%)	32 (33%)	96 (36%)	79 (30%)
IV	34 (35%)	38 (40%)	102 (38%)	98 (37%)
Uncertain	1 (1%)	2 (2%)	5 (2%)	7 (3%)

C, chemotherapy + supportive care; NoC, supportive care only; CV, cisplatin + vindesine; MIC, mitomycin, ifosfamide + cisplatin; MVP, mitomycin, vinblastine + cisplatin; NP, vinorelbine + cisplatin.

Overall, patients in the C group had an average of 3.45 more inpatient bed days than NoC patients (15.38 *v* 11.93 days), but this difference was not statistically significant ($p = 0.112$).

Chemotherapy

Patients randomised to receive chemotherapy were given up to three cycles of the chosen regimen (listed in table 2). For protocol chemotherapy drugs, the type and quantity of each drug given to each patient was recorded. The use of other drugs in the administration of chemotherapy (such as antiemetics, glucocorticoid, diuretic, mesna) was not recorded uniformly in the hospital notes. It was therefore assumed that, for each cycle, the patient received these drugs according to the trial protocol. Thus, the costing of concomitant drugs was regimen-specific but not patient-specific. Finally, for each cycle given, a single administration cost was used to cover staff time, consumables, and overheads regardless of which regimen they received.

For patients receiving chemotherapy off protocol, the type and quantity of drugs was recorded. As with protocol chemotherapy, a single administration cost was used. For all chemotherapy, no drug wastage was assumed.

There were six patients who, according to their records, received chemotherapy but for whom no doses were recorded. The four patients who had prior cycles were assumed to have had the same dose as before. The other two patients were missing dose information for all cycles and were assumed to have had the mean dose of patients on the same regimen.

Radiotherapy

All radiotherapy received was given palliatively and was assumed to be external beam radiotherapy, and a cost was assigned according to the number of fractions given. Patients for whom the number of fractions was missing were assumed to have had two fractions, this being the median number for the other patients.

It was expected that C patients would receive less palliative radiotherapy because they were receiving a primary treatment. In the event, C patients were only half as likely as NoC patients to have received radiotherapy (OR = 0.51, $p = 0.022$). For radiotherapy, both the number of courses and the number of fractions in each course determine the cost. NoC patients received 0.80 courses of radiotherapy on average compared with 0.65 courses for C patients, although this difference was not statistically significant ($p = 0.231$). The mean number of fractions per patient was 3.42 in the NoC group and 2.32 in the C group, although again statistical significance was not attained ($p = 0.125$).

Outpatient attendances

Outpatient attendances and day case admissions for the administration of chemotherapy were considered to be equivalent as the distinction between the two appeared to vary between centres and meaningful differential costs were not available. A high proportion of patients in each group had at least one outpatient attendance and this did not differ between the groups. There were, however, significant differences in the number of attendances per patient. Patients in the C group had a mean of 8.57 attendances compared with 5.55 for NoC patients ($p = 0.001$).

Investigations

The following investigations were recorded: radiographs (chest, abdominal, skull, spine and pelvis or lower limb), CT scans (chest and other), bronchoscopies, bone scans, ultrasounds, MRI scans, VQ scans, venograms, barium swallows, electrocardiograms, echocardiograms, and lung function tests. The mean number of chest radiographs per patient was 5.90 for the C patients and 4.34 for the NoC group, with 0.55 and 0.17 chest CT scans for the C and NoC groups, respectively.

Table 3 Description of use of major resources

Resource	C group (n = 98)	NoC group (n = 96)	p value
Hospitalisations			
All admissions			
No of patients hospitalised	92 (93%)	68 (72%)	0.0002
No of admissions per patient	2.73	1.27	
Total bed days per patient	15.38	11.93	
Chemotherapy admissions			
No of patients hospitalised	71 (72%)	0 (0%)	<0.0001
No of admissions per patient	1.34	0.0	
Total bed days per patient	3.35	0.0	
Non-chemotherapy admissions			
No of patients hospitalised	70 (71%)	68 (71%)	0.90
No of admissions per patient	1.38	1.27	
Total bed days per patient	12.03	11.93	
Chemotherapy			
Protocol chemotherapy			
No of patients receiving no cycles	6 (6%)	96 (100%)	<0.0001
No of patients receiving 1 cycle	19 (19%)	0 (0%)	
No of patients receiving 2 cycles	11 (11%)	0 (0%)	
No of patients receiving 3 cycles	62 (63%)	0 (0%)	
Non-protocol applications			
No of patients receiving treatment	15 (15%)	2 (2%)	0.003
Radiotherapy			
No of patients receiving a course	42 (43%)	58 (60%)	0.03
No of courses per patient	0.65	0.80	
No of fractions per patient	2.32	3.42	
Outpatient attendances			
No of patients who had at least one	84 (86%)	83 (86%)	0.91
No of attendances per patient	8.57	5.55	
Hospice admissions			
No of patients admitted	15 (15%)	14 (15%)	0.90
No of admissions per patient	0.29	0.21	
Total bed days per patient	4.65	3.42	
Surgical procedures			
No of patients who had			
No surgical procedures	76 (78%)	71 (74%)	0.74
One surgical procedure	17 (17%)	17 (18%)	
Two surgical procedures	6 (6%)	7 (7%)	
Three surgical procedures	1 (1%)	1 (1%)	
Investigations			
No per patient			
All radiographs	6.05	4.56	
Chest	5.90	4.34	
Abdominal	0.07	0.04	
All CT scans	0.87	0.46	
Chest	0.55	0.17	
Other	0.32	0.29	
ECG	0.93	0.61	

Surgical procedures

For costing purposes, surgical procedures were classified according to the grouping listed in table 1. A total of 49 patients had one or more surgical procedures, the commonest (received by 26 patients) being classified as minor thoracic (most often a pleural aspiration).

Hospice

Twenty nine patients had evidence of a referral or admission to a hospice. These hospices were contacted and asked to provide the dates of inpatient stays, day care attendances, and home care visits for each patient. All hospices were able to provide the dates of inpatient stays. In the case of disagreement between the hospital records and hospice databases, the hospice information was taken to be correct. As not all hospices were able to provide data on day and home care, these resources were excluded from the analysis.

Mean total costs

Patients in the C group incurred a mean total cost of £5355 compared with £3595 for the NoC patients ($p = 0.001$), a difference of £1760 (95% CI £781 to £2742). In order to identify the source of this cost difference, each patient's cost was broken down into protocol chemotherapy related costs (defined as the sum of the costs of the drugs themselves, the cost of administering the chemotherapy, and inpatient stays for the administration of chemotherapy) and all other costs. Total non-chemotherapy costs were compared between the two groups. Patients in the C group had a mean non-chemotherapy cost of £4122 compared with the mean total cost for NoC patients (which, by definition, consists of non-chemotherapy costs only) of £3595. This difference was not statistically significant ($p = 0.303$).

Primary care use

At the first visit to each centre (except the centre which was first visited in December 2000), the name and address of each patient's GP were extracted from their hospital records. Primary care data collection forms were posted to each GP representing a total of approximately 120 patients. Responses were received from the GPs of 87 patients, although most of these simply indicated that the patient's records had been sent to a health authority following his or her death. Resource use data were collected from these forms or from the health authority directly. In total, usable data for only 49 patients was received.

The primary care costs were generated from the number of contacts documented with the GP (differentiating between surgery, home and telephone contacts) and contacts with the practice nurse (at the surgery). Information regarding contacts with district nurses, Macmillan nurses, and other healthcare professionals such as physiotherapists or chiropodists was also requested. Most practices were able to provide details of referrals but not the number of contacts, so these visit costs were excluded from the analysis. Of the 49 patients, 29 were NoC patients who had a mean primary care cost of £258 compared with £245 for the 20 C patients. This difference in mean costs was not statistically significant ($p = 0.864$).

DISCUSSION

In this study the hospital notes of nearly 200 patients were reviewed to collect and record resource use. As complete patient data were required, 38 patients who were alive but had not yet survived 2 years were excluded. This does affect the representativeness of the sample as the survival of 531 patients not in the costs sub-study is better than the 194 in the costs study (HR 1.24). However, when the patients allocated to supportive care alone in the costs study are compared with those allocated to supportive care alone outwith the study, the HR for survival is 1.22. Similarly, for the supportive care plus chemotherapy patients in the costs study versus those outwith the costs study, the HR is 1.24. The survival difference is therefore consistent across the two treatment groups and the relative difference in costs of treatment between the two treatment groups should be reliable, even though the absolute overall costs may not be wholly accurate.

As patients received different amounts of chemotherapy and radiotherapy as well as different levels of supportive care, we were able to compile accurate patient-specific information. The main conclusions of the study were that patients receiving chemotherapy were more likely to be admitted to hospital and that those receiving supportive care only were more likely to receive palliative radiotherapy, but there was no difference in the mean number of bed days between the two groups.

The main cost driver in the current study was the non-chemotherapy costs which were similar in the two treatment groups and may be due in large part to high costs at death and during preceding morbidity. We estimated that patients in both trial groups incurred a cost of approximately £4000 for non-chemotherapy care, so we found no evidence that the cost of chemotherapy was offset by a reduction in subsequent non-chemotherapy costs. The chemotherapy patients incurred a cost of about £1300 for chemotherapy, so their mean total cost was higher than that of NoC patients.

Although quality of life data were collected in the Big Lung Trial using the EORTC QLQ core (C30)[4] and lung cancer module (LC13)[5] and daily diary cards,[6] the EuroQol EQ5D questionnaire[7] was not used and therefore quality adjusted life years (QALYs) could not be calculated. Nevertheless the quality of life analyses[3] suggested that the C group did not experience significantly worse quality of life. The National Institute for Clinical Excellence (NICE) has demonstrated a willingness to endorse the use of technologies that generate gains of one life year at an approximate cost of £30 000 per life year with full quality of life.[8] The cost of chemotherapy would therefore be compatible with the cost effectiveness of other treatments approved by NICE, even if the quality of life of patients receiving chemotherapy was appreciably lower than that of a healthy individual.

The strengths of the current study are that accurate patient-specific costs were compiled and resource use was collected during and up to 2 years after treatment. This contrasts with studies that make assumptions about resources based purely on the protocol being fully followed, and those that have ignored any costs of complications. Such studies should be viewed with caution. The limitations of the current study, however, are that it is probably only applicable to a UK based population and the data collection was retrospective and limited to patients with adequate information available at a sample of centres within the trial, although review suggested the sample to be representative.

Other studies have investigated the cost effectiveness of chemotherapy compared with supportive care alone for patients with advanced NSCLC using a range of costing methodologies. Jaakkimainen *et al*[9] examined the cost effectiveness of two chemotherapeutic regimens—vindesine and cisplatin (VP) versus cyclophosphamide, doxorubicin and cisplatin (CAP)—compared with supportive care in a Canadian clinical trial for patients with advanced disease. This study only estimated the costs of chemotherapy, hospitalisation, clinic visits, and radiotherapy. The resource use data were derived from two large cancer centres and were assumed to apply to the other centres in the trial. Assumptions were made about the number of non-chemotherapy clinic visits and the number of radiotherapy fractions given to each patient. Patients randomised not to receive chemotherapy had more hospital admissions and greater radiotherapy costs. The study showed that supportive care was found to be more expensive than CAP but less expensive than VP.

Further studies by the same group demonstrated another method of estimating costs in comparisons of cisplatin-based chemotherapy with supportive care. A model of resource utilisation and direct costs specific to Canadian patients with lung cancer was used to estimate the costs of diagnostic evaluation and physician contacts. The cost of administering chemotherapy was based on detailed observation of time spent at one cancer centre. Assumptions were made about the length of hospitalisation for the administration of chemotherapy, the number of cycles given, resource use for terminal care, and the doses of radiotherapy given. These assumptions were based on previous published studies including those from Jaakkimainen *et al*.[9] Using this method, Evans and Le Chevalier[10] found a number of chemotherapy regimens (including vinorelbine alone and vinblastine-cisplatin) to be less expensive than supportive care alone while vinorelbine-cisplatin with inpatient administration and vindesine-cisplatin were more expensive, and Evans[11] reported that single agent gemcitabine also appeared to be a cost effective intervention.

In the UK, Billingham *et al*[12] examined the patterns of care and associated costs of a representative sample of 116 patients entered into a randomised trial of supportive care with or without MIC chemotherapy. Data were collected from hospital, GP and hospice notes, and patient-specific costs were calculated by multiplying resource use by unit costs. The results closely mirror those obtained in the current study, with a mean total cost of £6999 for patients receiving chemotherapy and £4076 for those on supportive care alone. As the chemotherapy group experienced a survival benefit of 2.4 months, this translated into a cost of £14 620 per life year gained.

Clegg *et al*[13] undertook a systematic review to assess the clinical effectiveness of paclitaxel, docetaxel, gemcitabine and vinorelbine, and then applied a costing model to estimate the cost effectiveness of these drugs compared with supportive care alone. The costing model only included the costs of the drugs plus a set cost to cover drug related adverse events. However, they then performed a variety of sensitivity analyses using a range of variables including number of cycles of chemotherapy, discounted prices, and costs of newer antiemetic regimens. They suggested that the regimens with the least incremental cost effectiveness over supportive care

were vinorelbine, vinorelbine/cisplatin, and gemcitabine. In addition, gemcitabine/cisplatin and paclitaxel/cisplatin were considered reasonably cost effective while paclitaxel and docetaxel were considered relatively expensive.

Other trials and reviews (for example, Kennedy *et al*[14]) have come to similar conclusions that cisplatin-based chemotherapy is more clinically effective than supportive care alone, is more costly, but is within reasonable limits of cost effectiveness, especially if outpatient administration can be used.

Interestingly, second and third line chemotherapies may be less cost effective. Leighl *et al*[15] reported that docetaxel (which showed a 2.9 month survival over supportive care) cost $57 000 per life year gained while Holmes *et al*,[16] using data that showed a 3.8 month survival benefit, calculated the cost per life year gained to be £13 863.

Numerous comparisons of the cost effectiveness of different chemotherapy regimens for the first line treatment of patients with advanced NSCLC have been conducted[17–27] but, because of the inconsistency of control arms, the different methods to calculate costs used, and the fact that the studies were performed in different countries (and therefore relate to different local conditions and pricing structures), it is difficult to summarise the findings and, indeed, the results can appear somewhat contradictory. For example, cisplatin/paclitaxel was considered by Earle *et al*[22] to be a cost effective improvement over cisplatin/etoposide while Sacristan *et al*[20] found no differences in total costs between cisplatin/etoposide and cisplatin/gemcitabine. Schiller *et al*,[21] however, reported that cisplatin/gemcitabine is associated with lower treatment related costs than cisplatin/paclitaxel. Nevertheless, regimens that can be given to outpatients consistently appear to be more cost effective.

In the supportive care setting, the Big Lung Trial confirmed the NSCLC meta-analysis[1] by showing a survival benefit of about 10 weeks with cisplatin-based chemotherapy.[2] It also showed that patients on chemotherapy did not experience a worse quality of life.[3] The current paper suggests that the addition of chemotherapy incurs a cost that is well within NICE guidelines and therefore should not be a factor in decision making.

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