LUNG CANCER

Lung cancer patterns of care in south western Sydney, Australia

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Background: Lung cancer is the leading cause of cancer deaths in New South Wales (NSW). There is a significantly higher incidence of lung cancer in the South Western Sydney Area Health Service (SWSAHS) than the NSW average. The aim of this study was to document patterns of lung cancer care for SWSAHS residents.

Methods: SWSAHS residents diagnosed with lung cancer in 1993 and 1996 were identified from the NSW Central Cancer Registry and their medical records reviewed.

Results: The study population comprised 527 patients of median age 68 years. 12% did not see a lung cancer specialist, 9% did not have a pathological diagnosis, and 28% did not receive any active treatment throughout the course of their illness. The median survival was 6.7 months and the 5 year overall survival was 8% (95% CI 6 to 10). The rates of pathological diagnosis, specialist referral, and treatment decreased with older age and poorer performance status.

Conclusions: The management of lung cancer patients in SWSAHS is suboptimal. A significant proportion of patients are not receiving treatment. To improve patient care and outcomes, all lung cancer patients should be referred to a specialist for management, ideally in a multidisciplinary setting. Both consumers and general practitioners need to be educated about options available for the management of lung cancers and ageist and nihilistic attitudes need to be overcome.

I n New South Wales (NSW) lung cancer is the fourth most common cancer with a crude incidence of 42.3 per 100 000. It is the leading cause of deaths from cancer, accounting for 19% of deaths, which is more than double that of any other cancer.[1] It is thus an important cause of morbidity and mortality in the Australian population. The relative 5 year survival from lung cancer in NSW is 10% in men and 12% in women.[2] These figures are lower than rates in Canada and the USA (14–15%).[2]

Across NSW there are geographical differences in lung cancer incidence and mortality. Men in the South Western Sydney Area Health Service (SWSAHS) have a significantly higher incidence and mortality from lung cancer than the NSW average.[3] SWSAHS is a large area health service covering 6237 square kilometres and comprises 12% of the NSW population. It incorporates metropolitan and semi-rural suburbs and has a greater proportion of overseas born residents (34%) than NSW (23%), with a significant proportion from non-English speaking backgrounds (27%).[4] It contains areas of socioeconomic disadvantage with residents having lower education levels, higher unemployment rates, and more low income earners than the NSW average.[4]

To assess whether SWSAHS residents are receiving optimal management of lung cancer we conducted a patterns of care study. The aim of the study was to look at processes and outcomes and thereby to identify deficiencies in care and suggest mechanisms for improvement. The impetus for such a study is the recognised variation in management of lung cancer that has previously been documented in Victoria, Australia.[5] Hypothetical scenarios given to doctors confirm this variability. "What happens to people with this disease depends largely on the personal beliefs of their doctors and the fate of the individual patient is determined by accidents of geography and patterns of referral that lead him or her to one doctor's office rather than another".[6]

METHODS

The study population was identified from the NSW Central Cancer Registry. This is a population based registry that receives statutory notification of all cancer diagnoses in NSW. To improve accuracy of case identification, databases at three oncology centres were also searched to identify patients. This included the database of the comprehensive cancer care centre that opened in SWSAHS in 1995 and the two major oncology

Table 1 Characteristics of study patients

Characteristic	Overall	NSCLC	SCLC	NPD	p value*
n	527	397	82	48	
Median age (years)	68	68	66	75	p<0.001
M:F (%)	70:30	70:30	67:33	73:27	NS
ECOG 0,1 (%)	55	60	61	18	p<0.001
ECOG 2,3,4 (%)	45	40	39	82	p<0.001
Australian born (%)	58	57	61	60	NS
English speaking (%)	83	84	84	76	NS

NSCLC=non-small cell lung cancer; SCLC=small cell lung cancer; NPD=no pathological diagnosis;
ECOG=Eastern Cooperative Oncology Group performance status.
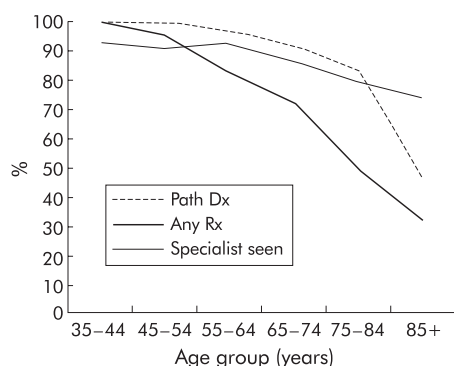*Comparisons between patients with no pathological diagnosis and those with a pathological diagnosis.

Figure 1 Rates of pathological diagnosis, specialist referral, and treatment per age group. Path Dx=pathological diagnosis; any Rx=any active treatment (surgery, radiotherapy, chemotherapy) at any stage of the illness.

centres in other areas to which patients were referred for radiotherapy and/or chemotherapy before 1995.

The incident cases were SWSAHS residents (as defined by postcode) diagnosed with lung cancer in two time periods (1 January 1993 to 31 December 1993 and 1 January 1996 to 31 December 1996). Those with non-invasive diagnoses such as carcinoid were excluded. Medical and oncology records were reviewed to collect information on patient demographic data, tumour characteristics, investigations, treatment details, and outcome.

The date of diagnosis was the date of first pathological confirmation or date of radiological diagnosis if pathology was not obtained. A lung cancer specialist was defined as a respiratory physician, thoracic surgeon, radiation or medical oncologist. Active treatment included any surgery, radiotherapy, or chemotherapy at any stage of the patient's illness. Stage was assigned using the TNM system,[7] and performance status using the Eastern Cooperative Oncology Group (ECOG) scale[8] which rates patients on a 5 point scale from being able to carry out normal activities (ECOG 0) to being bed bound (ECOG 4).

The study was approved by the Statewide Health and Confidentiality Ethics Committee, the ethics committee of the NSW Cancer Council, and the ethics committees of all hospitals at which records were examined.

Data analysis

SPSS 11.0 software was used for data analysis. The χ^2 test was used to compare categorical variables and the t test to compare means. Multivariate analyses were performed using logistic regression.

RESULTS

The NSW Central Cancer Registry identified 528 SWSAHS residents diagnosed with lung cancer in either 1993 or 1996. Of these, 14 were excluded for the following reasons: different year of diagnosis (n=6), non-SWSAHS resident (n=3), non-lung cancer diagnosis (n=5). A further 13 patients were included in the study who were identified from the oncology databases in treating institutions (10 with non-small cell lung cancer (NSCLC), two with small cell lung cancer (SCLC), and one with a clinical diagnosis of lung cancer). Th final study population therefore consisted of 527 patients. Only 11% were alive at the end of the study in December 2001.

Patient and tumour characteristics

The characteristics of the study population are shown in table 1. 70% of the population were men and the median age was 68 years (range 35–91); 75% had NSCLC and 16% had SCLC. A pathological diagnosis was not obtained in 9% of cases. The rate of pathological diagnosis decreased with age (p<0.001, fig 1). These patients also had significantly poorer performance status.

In 14% of patients with SCLC and 20% with NSCLC there was inadequate information to assign a stage. Where stage was documented, 25% of those with NSCLC presented with stage 1 or 2 disease, 40% with stage 3, and 35% with stage 4 disease. Equal proportions presented with limited and extensive SCLC.

Medical care

12% of patients did not see a lung cancer specialist; 61% saw a respiratory physician, 25% a thoracic surgeon, 56% a radiation oncologist and, 36% a medical oncologist. Specialist referral fell with age (p=0.03, fig 1). A pathological diagnosis was obtained in 95% of patients who received specialist care compared with 61% of those who did not (p<0.001); 79% of patients who saw a specialist received treatment.

Table 2 Investigations and treatment

	Proportion of patients (%)			
	Overall	NSCLC	SCLC	NPD
Investigation type				
Chest radiography	99	99	100	100
Chest CT scan	91	92	91	78
Liver imaging	57	54	77	51
Brain CT scan	20	19	32	10
Bone scan	36	36	55	10
Bronchoscopy	56	62	49	16
Mediastinoscopy/mediastinotomy	5	7	1	0
PET scan	2	3	0	0
Treatment				
No treatment*	28	25	13	80
Radiotherapy only	35	42	3	20
Radiotherapy and chemotherapy	12	6	50	0
Surgery only	9	12	0	0
Surgery and radiotherapy	7	9	1	0
Chemotherapy alone	6	2	28	0
Surgery, radiotherapy and chemotherapy	2	2	1	0
Surgery and chemotherapy	1	1	4	0

NSCLC=non-small cell lung cancer; SCLC=small cell lung cancer; NPD=no pathological diagnosis.
*This was defined as no active treatment (surgery, radiotherapy, chemotherapy) at any stage of the patient's illness from diagnosis to death or last follow up.

Table 3 Odds ratios for pathological diagnosis, specialist referral, and treatment from multivariate logistic regression model

	Pathological diagnosis (%)	OR for obtaining pathological diagnosis	95% CI	p value
Age (years)				0.001
<55	100	1		
55–64	97	0.96	0.89 to 1.05	
65–74	92	0.97	0.90 to 1.05	
75+	77	0.86	0.75 to 0.93	
ECOG				0.03
ECOG 0,1	97	1		
ECOG 2,3,4	85	0.95	0.91 to 0.99	
Language				0.01
English	92	1		
Other	87	0.93	0.88 to 0.98	
Specialist				<0.001
No	61	1		
Yes	95	1.52	1.4 to 1.65	
	Specialist referral (%)	OR for specialist referral		
ECOG				<0.001
ECOG 0,1	97	1		
ECOG 2,3,4	85	0.88	0.84 to 0.92	
	Any treatment (%)	OR for receiving treatment		
Age (years)				p<0.001
<55	96	1		
55–64	84	0.91	0.8 to 1.04	
65–74	73	0.84	0.75 to 0.96	
75+	47	0.69	0.60 to 0.79	
ECOG				p<0.001
ECOG 0,1	88	1		
ECOG 2,3,4	55	0.77	0.71 to 0.83	

OR=odds ratio; 95% CI=95% confidence interval.

Investigations and treatment

The types of investigations performed are outlined in table 2. Those without a pathological diagnosis were less likely to have a chest radiograph, bone scan, or bronchoscopy (p<0.001). Patients with SCLC were more likely to have imaging of the liver (p<0.001), a brain CT scan (p<0.05), and a bone scan (p<0.01). Bronchoscopy was used more frequently in patients with NSCLC (p<0.05).

The combinations of treatment delivered at any time during the course of the illness are presented in table 2 and show that 28% of patients had no active treatment. These patients were older (median age 73 years v 67 years, p<0.001) and of poorer performance status (74% ECOG 2 or greater v 33%, p<0.001) than those who had treatment. The rate of treatment decreased with age, especially over the age of 55 years (p<0.001, fig 1). Of the patients who did not receive any treatment, 31% did not see any specialist involved in lung cancer management.

Predictors of care

On multivariate analysis poorer performance status was an independent predictor for lack of pathological diagnosis, less specialist care, and reduced treatment delivery (table 3). Patients who did not speak English and those who were not referred to a specialist were less likely to have pathological confirmation of their lung cancer. Increasing age was also an independent predictor for not obtaining a pathological diagnosis or receiving treatment. Sex, country of birth (Australian born v overseas born) and socioeconomic status were not significantly associated with these outcomes.

Survival

The median survival for the whole group of patients was 6.7 months. The 1, 2, and 5 year actuarial survivals were 33% (95% CI 29 to 37), 16% (95% CI 13 to 19), and 8% (95% CI 6 to 10), respectively. The median survival for limited and extensive stage SCLC was 17 months and 5 months, respectively, and the median survival for NSCLC stages 1, 2, 3A, 3B, and 4 was 2.7 years, 1.6 years, 11 months, 7 months, and 19 weeks, respectively. The median survival for those without a pathological diagnosis was 10 weeks.

DISCUSSION

This study is the first to examine patterns of care for lung cancer patients in NSW in an attempt to identify deficiencies in management. It is unique in the Australian setting. The methodology differs from the patterns of care study in Victoria, Australia in that the data were collected by a single investigator and not by a mailed questionnaire. More information was recorded than is collected by cancer registries, particularly with regard to details of medical care, investigations, and treatment during the whole course of the illness.

No pathological confirmation of the diagnosis was obtained in 9% of patients. This is lower than for Victoria (12%) and NSW (11%) but higher than for South Australia (4%).[3 5 9] There are several possible reasons for this. The poorer performance status of these patients may have made a diagnostic procedure more hazardous. In addition, a diagnostic work up may have been omitted if it was felt that the patients' poor performance status would preclude any active treatment. These patients were also older, but age alone is not a sufficient reason not to obtain pathological confirmation. There may have been inadequate access to medical care with significantly fewer pathological diagnoses in patients not referred to a specialist. Increasing age and lack of referral to a respiratory physician have been linked to a higher likelihood of not obtaining a pathological diagnosis.[10]

Twenty eight percent of patients received no active treatment at any time in the course of their illness. This is comparable to the Victorian rate of no treatment of 25%.[5] In South Australia 32% received no initial treatment but subsequent treatment was not recorded.[9] Although poorer performance status of these patients may have precluded active treatment, 26% of those not receiving treatment were of good performance status (ECOG 0 or 1). These patients were

Table 4 Comparison with overseas series

	SWSAHS 1993 & 1996	Glasgow, 1991–2[20]	Scotland, 1995[16]	France, 1987–8[13]
n	527	262	3855	615
M:F (%)	70:30	66:34	61:39	90:10
Median age (years)	68	NR	70	NR
>75 years	21%	12%	NR	21%
Pathology	All lung cancer	All lung cancer	All lung cancer	NSCLC
NPD	9%	21%	26%	NR
No treatment overall	28%	38%	43%	NR
No treatment in NSCLC	25%	NR	NR	18%
Median survival (months)	6.7	NR	3.6	NR
3 year survival	11%	9%	7%	
18 month survival in NSCLC	22%	NR	NR	30–35%

NPD=no pathological diagnosis; NSCLC=non-small cell lung cancer; NR=not recorded.

also older than those receiving treatment, but age alone is a poor discriminator for treatment tolerance. Other studies have confirmed that age at diagnosis is the most consistent factor affecting therapeutic choice in NSCLC for both locoregional and distant disease,[11] and that the rate of treatment decreases with age regardless of performance status.[10] [12] [13] Increased rates of pathological diagnosis and more active treatment results in improved survival, particularly for those aged 70 years and over.[14]

Specialist referral is needed to obtain any active treatment of lung cancer; 31% of patients not receiving treatment did not see a specialist, which suggests that the decision for no active treatment was made by the patient and/or their general practitioner. A population based study in the USA suggested that patterns of care for chemotherapy in metastatic lung cancer are determined by whether or not referral was made to an oncologist.[15] Patients who were referred to a specialist within 6 months of diagnosis were found to have significantly better survival.[16] However, it is unclear whether any lack of specialist care is due to the clinicians' decision or patients' choice not to seek a specialist opinion.

In lung cancer nihilistic attitudes of doctors may be a contributory factor to the high rates of no treatment. North American surveys of specialists involved in lung cancer management have recommended a wide variety of treatments.[6] [17] Treatment preferences were influenced by specialist training with each discipline showing a preference for its own treatment modality.[17] Given a clinical scenario of stage 3 NSCLC that is potentially curable, the recommendation of no immediate treatment varied from 8% of thoracic surgeons to 29% of respiratory physicians.[17] The likelihood of no treatment correlated inversely with the number of lung cancer patients seen by the specialist.[17] These factors can be extrapolated to general practitioners who may not be aware of the benefits of non-surgical treatment and who each may only have a few patients with lung cancer in his or her practice. Lung cancer survival has improved with modern chemotherapy and radiotherapy and this information needs to be disseminated to referring doctors.[18] [19]

The survival from lung cancer is poor. However, the survival of SWSAHS lung cancer patients appears to be superior to populations studied in Glasgow and Scotland but inferior to patients in France (table 4).[13] [16] [20] This suggests that outcomes are improved if a greater proportion of patients have a histopathological diagnosis and receive treatment. However, beyond basic demographic data, it is difficult to ascertain whether the populations are truly comparable. Survival in lung cancer can be increased with higher rates of active treatment, be it curative or palliative.[21]

This study is limited by the retrospective nature of the data collection. Prognostic information is not always recorded, and it is difficult to assess factors such as patient co-morbidity and symptoms that may impact on therapeutic decisions.

Nevertheless, it does highlight deficiencies in lung cancer care in SWSAHS and provides an important benchmark from which to measure future improvements.

To improve the care of lung cancer patients in SWSAHS, patients and their general practitioners need to be educated about the therapeutic options available. Ageist and nihilistic attitudes about lung cancer need to be overcome. Although survival gains with treatment may be small, these become clinically significant when it is realised that lung cancer is the leading cause of cancer related mortality in NSW. Furthermore, as most patients present with advanced disease, quality of life rather than survival becomes an important end point.

All patients with lung cancer should be referred to a specialist. Management by a specialist has been shown to be an independent predictor of access to potentially curative treatment and improved survival in lung cancer.[16] Better outcomes may also be achieved by offering multidisciplinary assessment and management to all patients. Implementation of specialist multidisciplinary teams in the UK have resulted in improved outcomes in terms of increased surgical resection rates, more curative treatment offered to the elderly, and increased use of chemotherapy and radiotherapy.[22] [23] The follow up period of this study is too short to comment on survival.

The creation of a dedicated specialist unit to oversee management of all patients with lung cancer in an area may improve outcomes by reducing variability in practice through education and development of standard protocols. The formation of national guidelines for the management of lung cancer is underway and will be a welcome step in promoting better management.

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Efficacy of pneumococcal vaccine

▲ Whitney CG, Farley MM, Hadler J, et al. Decline in invasive pneumococcal disease after the introduction of protein-polysaccharide conjugate vaccine. N Engl J Med 2003;**348**:1737–46

▲ Jackson LA, Neuzil KM, Yu O, et al. Effectiveness of pneumococcal polysaccharide vaccine in older adults. N Engl J Med 2003;**348**:1747–55

Streptococcus pneumoniae is the most common cause of pneumonia in the elderly but it is also responsible for bacteraemia, particularly in the very young. These two studies looked at the impact of two vaccines in preventing pneumonia in the elderly and invasive disease in a younger population.

In 2000 a 7-valent polysaccharide vaccine was licensed in the USA for use in young children. The first study assessed the incidence of invasive streptococcal disease in seven regions in the USA before and after the introduction of the vaccine. The rate of invasive disease fell from 24.3 cases per 100 000 in 1999 to 17.3 per 100 000 in 2001. There was a 69% fall in the incidence in children under 2 but, interestingly, also a 32% decrease among adults aged 20–39. This was accompanied by a smaller but still significant fall in the incidence in older adults. The rate of disease caused by non-penicillin susceptible strains decreased from 6.3 per 100 000 to 4.1 per 100 000. The vaccine is decreasing the burden of invasive disease in children and possibly also in adults, perhaps by decreasing transmission. It remains to be seen whether the vaccine will be effective in slowing the emergence of resistant pneumococci or whether disease due to non-vaccine serotypes will become more common.

A 23-valent polysaccharide vaccine is recommended for those over 65 to prevent invasive disease, but it is not clear if it alters the incidence of pneumonia. The second study retrospectively assessed a cohort of 47 365 people over the age of 65 for 3 years. The primary outcomes were community acquired pneumonia (CAP) and pneumococcal bacteraemia. Receipt of the vaccine was associated with a significant reduction in the risk of bacteraemia (hazard ratio (HR) 0.56; 95% CI 0.33 to 0.93) but did not alter the risk of CAP (HR 1.07; 95% CI 0.99 to 1.14). This study supports the effectiveness of the vaccine in preventing bacteraemia but suggests that other strategies are required to combat the more common problem of pneumonia, perhaps involving the development of other vaccine formulations such as protein conjugate pneumococcal vaccines and protein vaccines.

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