The influence of socio-economic and locational disadvantage on patterns of surgical care for lung cancer in Western Australia 1982–2001

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Abstract

Objective: Patterns of in-hospital surgical care for lung cancer in Western Australia were examined, including the effects of demographic, locational and socio-economic disadvantage and the possession of private health insurance, on the likelihood of receiving surgery.

Patients and methods: The WA Record Linkage Project was used to extract hospital morbidity, cancer and death records of all people with lung cancer in Western Australia from 1982 to 2001. The likelihood of receiving lung cancer surgery was estimated, after adjustment for co-variates, using logistic regression.

Results: Overall, 16% of patients received surgery for their lung cancer, although this varied according to histology. Patients who received surgery were typically younger, female, non-indigenous and had less comorbidity. Patients from socio-economically disadvantaged groups tended to be less likely to receive surgery (OR 0.79; 95% CI 0.61–1.04) although this was not significant for each category of disadvantage. Those who had their first hospital admission, with a mention of lung cancer, in a rural hospital were less likely to receive surgery (OR 0.26; 95% CI 0.19–0.36) than those in metropolitan hospitals, although residential location generally had less effect (OR 0.36; 95% CI 0.14–0.92). Patients admitted as a private patient either to a private or public hospital for their first mention of lung cancer had increased likelihood of receiving surgery (OR 1.15; 95% CI 1.02–1.30); however first admission to a private hospital had no effect (OR 0.99: 95% CI 0.85-1.16).

Conclusion: The utilisation of lung cancer surgery was low with several factors found to affect the rate. Patients from socio-economically or locationally disadvantaged backgrounds, indigenous patients or patients without private health insurance were less likely to receive lung cancer surgery than those from more advantaged groups.

Introduction

In Australia, lung cancer is the third most common cancer in men and the fourth in women. It is, however, the leading cause of cancer-related death (Elwood *et al.*, 2003), accounting for more person-years of life lost (43,343 in 1999) than any other malignancy. In 1999, there were 7,826 new cases registered with the Australian cancer registries. While there was a slight annual decrease in incidence and mortality in males between 1990 and 1999 (1.9% and 1.8% per annum respectively), an increase in both incidence and mortality of 1% was recorded in women aged over 65 years. In Western Australia, the age standardised incidence and mortality rates from lung cancer were higher than in other Australian states except Tasmania and the Northern Territory. These rate changes and differences were reflective of smoking patterns during the 1970s and 1980s (Australian Institute of Health and Welfare (AIHW), 2002, AIHW and Australasian Association of Cancer Registries (AACR), 2002).

There are two broad histological categories of lung cancer, small and non-small cell. Non-small cell lung cancer (NSCLC) comprises about 80% of all lung cancer and consists of adenocarcinoma (including bronchoalveolar carcinoma), adenosquamous, squamous and large cell. The prognosis after a diagnosis of NSCLC is poor with only 10-15% of patients surviving five years or longer (Beadsmoore *et al.*, 2003, van Dijck *et al.*, 2001, Novello *et al.*, 2001, Alpard *et al.*, 1999, Richardson *et al.*, 2000, AIHW & AACR, 2003), whilst for small cell lung cancer (SCLC) the five-year survival is even worse at 1-5% (Beadsmoore *et al.*, 2003). A reason for the poor prognosis of lung cancer in general is the lateness of presentation, with many already having lymph-node involvement and metastatic spread (van Dijck *et al.*, 2001). Thus at the time of presentation the opportunity for curative treatment has often passed and palliation is the objective of clinical management (Elwood *et al.*, 2003). For some patients found early, in stages I to IIIA, surgery with adjuvant chemotherapy and/or radiotherapy may be appropriate (Alpard *et al.*, 1999), whilst for others chemotherapy or radiotherapy may be a more appropriate option to improve prognosis (Miller *et al.*, 2002, van Dijck *et al.*, 2001). The literature has identified advanced stage, nodal involvement, metastases and poor general fitness as the factors limiting treatment options. In Australia, no attention has been given to socio-demographic characteristics and the potential for surgical treatment options to be effectively limited by locational and economic constraints affecting access to health services. Assessment of the equity of access is a salient consideration in Australia, where its system of universal health care should ensure that all patients are equally as likely to receive treatment for serious diseases regardless of their social, economic or locational circumstances.

We used the WA Record Linkage Project (Holman *et al.*, 1999a) to examine factors affecting surgical treatment patterns in lung cancer patients in Western Australia (WA) from 1982 to 2001. We investigated the effects of social and locational disadvantage and the possession of private health insurance on the uptake of lung cancer surgery. This study was unable to investigate the influence of disadvantage on chemotherapy or radiotherapy treatment patterns, as the hospital morbidity system did not identify these if they were given on an outpatient basis and therefore case ascertainment would have been biased.

Patients and methods

Linked data and case selection

The WA Record Linkage Project was used to extract all hospital morbidity, cancer registrations and death records of all residents of WA, with any mention of lung cancer in any record. The ICD diagnostic codes used for this extraction were ICD-9 162 and ICD-10-AM C33 and C34 (Wingo *et al.*, 2000, AIHW & AACR, 2002). A case was defined as a person with a diagnosis of primary lung cancer in the cancer registry or, in cases with no cancer registration, a primary lung cancer diagnosis on their hospital separation record together with a lung cancer code as their cause of death. Only patients with a date of first diagnosis from 1st January 1982 to 31st December 2001 were included in the study.

There were 12708 cases that met the definition. Of these 7200 (57%) had undergone at least one diagnostic procedure (biopsy, thoracoscopy/bronchoscopy, exploratory surgery) in a hospital setting for lung cancer. There were 1570 who progressed to having a surgical procedure (defined as pneumonectomy, lobectomy, wedge resection, bronchial/endo/tracheal resection) for their lung cancer, some patients had more than one surgical procedure. Almost all of the cases had a linked lung cancer registration (n=12637, 99.5%); only 71 cases had a death record and hospital record for lung cancer without a WA cancer registration. A death was recorded for 11218 (88.2%) of the cases. In 8019 (63.0%) of these, lung cancer was the underlying cause of death.

The histology of each cancer registration was recorded on the cancer registry, allowing categorisation as adenocarcinoma, adenosquamous, squamous and large cell (NSCLC) or small-cell carcinoma (SCLC). Cancers recorded as lung cancer (ICD-9 162-162.9, ICD-10-AM C33 and C34) that did not fall into these categories (e.g. sarcomas, malignant neoplasms not otherwise specified (NOS) and carcinoma NOS) were termed 'other malignancy'. Analysis was carried out with and without 'other malignancy' to determine the effect of this group. The coefficients and their significance in the logistic models were found to be very similar and therefore 'other malignancy' has been included in the results.

The Charlson comorbidity index was used to adjust for the effects of comorbidity in the regression analysis (Charlson *et al.*, 1987, Romano *et al.*, 1993, Holman *et al.*, 1999b, Bach *et al.*, 1999). This index consisted of 17 groups of ICD codes weighted according to mortality risk (lung neoplasms were excluded); the total weighted index was divided into three discrete intervals. Only comorbidity present at the time of the admission for the primary lung cancer procedure or identified from hospital morbidity records in the previous 365 days contributed to the index.

Assignment of indices of disadvantage

To examine the effect of socio-economic disadvantage on treatment patterns we assigned each record, based on residential address, with an Index of Relative Socio-economic Disadvantage (IRSD) as published from Western Australian census collector district (CD) data for 1991 and 1996. Based on aggregated household and individual attributes, the IRSD had five categories dividing the population into quartiles of disadvantage with the lowest quartile subdivided into the 15% and 10% most disadvantaged (Australian Bureau of Statistics (ABS), 1998). Likewise, the Accessibility/Remoteness Index of Australia (ARIA) was assigned to each CD based on residential address. In cases where the CD was unavailable, the postcode was used. Analysis using IRSD or ARIA codes was restricted to admissions occurring after 1st January 1991, when CDs first became available via address mapping.

Analysis of the patterns of surgical care

Univariate and bivariate (t-tests and Chi square) analyses, followed by crude and adjusted logistic regression analyses of the likelihood of receiving any lung cancer surgery were carried out with surgery as a binary dependent variable. Surgery was defined as one or more of pneumonectomy, lobectomy, segmentectomy, wedge resection or excision/resection of the bronchus, trachea or endotracheal. The Box-Tidwell transformation (age χ ln[age]) was placed in the regression models with a continuous age covariate to achieve the best fit for adjustment purposes (Hosmer *et al.*, 1989). The analysis was performed using SPSS Version 10.0.7. (2000) Ethical approval for the study was granted by The Human Research Ethics Committee of The University of Western Australia.

Results

The number of people diagnosed with lung cancer increased slowly between 1982 (n=490) and 2001 (n=703). Lung cancer surgery occurred in only 12.4% (n=1570) of the patients with no increase in frequency over time, although there was tendency towards more wedge resections and lobectomies and less pneumonectomies (Figure 1). There were few lesions small enough to permit endo/tracheal or bronchial resection (n=25). Lobectomy was the most common surgery performed, accounting for 64% of all surgery; the remainder was evenly divided between pneumonectomy and segmentectomy/wedge resection (Table 1). Four patients had a segmentectomy/wedge resection followed at a later date by lobectomy, although whether this was on the same lobe of the lung was unknown. Patients with adenocarcinoma (21%) or squamous cell carcinoma (18%) were the groups most likely to receive surgery.

The characteristics of the patients who underwent hospital treatment for their lung cancer between 1982 and 2000 are shown in Table 2. Those who were younger or had less comorbidity were more likely to undergo a surgical procedure. Patients with a cancer histology of adenocarcinoma or squamous cell carcinoma were more likely to have lung cancer surgery, whilst those with small cell carcinoma were the least likely. The proportion having surgery decreased markedly if the first admission with a mention of lung cancer was to a rural hospital or if the person was treated as a public patient. Patients with higher levels of social disadvantage and those living in remote areas were less likely to receive surgery.

Using logistic regression analysis to study independent effects, it was shown that women, patients who were younger, who described themselves in marital status categories other than 'never married', who were non-indigenous or had less comorbidity had a greater likelihood of having surgery (Table 3). Patients with an adenocarcinoma were significantly more likely to receive surgery, whilst those with SCLC were least likely. If the first admission with a mention of lung cancer was to a rural hospital then lung cancer surgery was significantly less likely to occur. Surgery occurred less often for patients resident in rural areas, although this was not significant in every case. Similarly, being treated as a public patient decreased the likelihood of surgery, whereas care in a public vs. private hospital had no effect. Being socio-economically disadvantaged also decreased the likelihood of surgery, although again this was not significant in every category (Table 3).

A second logistic regression analysis on the later years (1991-2000) see Table 3, was adjusted simultaneously for the social, locational and health insurance factors, as data on these factors were unavailable in the earlier years. It showed very similar results to the models adjusted only for demographic factors. The wider confidence intervals reflect the smaller numbers of cases analysed from this period of time.

Discussion

This study set out to examine the pattern of surgical care of lung cancer in Western Australia and the social, locational and economic factors that influenced the degree of health care intervention that patients received. The results indicated that patients who were younger, described themselves as other than 'never married', were female, non-indigenous or less affected by comorbidity were more likely to receive surgery. Patients from socially, economically and locationally disadvantaged groups were less likely to receive surgery even after adjustment for confounding by other factors.

This study found that a first admission for lung cancer to a rural hospital greatly diminished the likelihood of having any surgery for lung cancer, as was shown also in studies from the US (Earle *et al.*, 2002) and Europe (Cartman *et al.*, 2002, van Dijck *et al.*, 2001). The declining trend in the odds of lung cancer surgery from the least to the most remote place of residence seen in this study was similar to that reported from both the US (Silverstein *et al.*, 2002) and UK (Campbell *et al.*, 2002), although Smith *et al.* (1995) in the US found that older urban patients were less likely to undergo surgery.

There are a number of plausible explanations for the rural/urban differences found in this study. It is possible that people from non-metropolitan areas present with lung cancers that are more advanced and past the stage where surgery is a feasible option. The evidence concerning a relationship between residential location and stage has been mixed with one population-based study from the southern US finding that distance to the nearest hospital predicted a later stage of lung cancer, although, rurality of residence did not (Silverstein *et al.*, 2002). Other studies have shown an association between location of residence and advanced lung cancer stage (Campbell *et al.*, 2001, Liff *et al.*, 1991, Jong *et al.*, 2002). Another US study, by Smith *et al.* (1995), found that living in an urban area reduced the likelihood of treatment in older patients with a similar stage of disease. The possibility of alternatives to surgery, such as chemotherapy or radiotherapy, being used to treat rural patients is also plausible, however, an examination of the present data found no evidence of higher rates of these adjuvant therapies in WA inpatients from rural areas. Moreover, the recurrent nature of adjuvant treatment, usually administered in metropolitan hospitals, makes this an unlikely scenario.

This study found a positive relationship between surgery and socio-economic advantage. In the US, with its highly privatised system of health care, a similar picture was seen, especially in black Americans (Polednak, 2001, Bach *et al.*, 1999, Silverstein *et al.*, 2002, Earle *et al.*, 2002, Smith *et al.*, 1995). The UK, which has a universal system of health care, has reported mixed results with one study finding no relationship between socio-economic status and likelihood of treatment (Cartman *et al.*, 2002) and another the converse (Campbell *et al.*, 2001). The tendency for a surgical approach to be adopted in patients treated as private patients may reflect a greater demand for action among more affluent and educated groups. As with rurality, differences in lung cancer stage could be a determining factor in the decision to offer surgery, however, large population-based studies in Scotland have found no evidence of more advanced lung cancer stage in socio-economically disadvantaged patients (Campbell *et al.*, 2001, Brewster *et al.*, 2001) and neither have studies in the US by Greenberg *et al.* (1988) and Silverstein *et al.* (2002). While stage of disease at presentation may be responsible for some of the variation in the likelihood of receiving lung cancer surgery, it is unlikely to explain the difference completely.

Western Australia was similar to the US in having stable surgical rates over the period 1988 to 1995 (Wingo *et al.*, 2000). From the Netherlands, van Dijk *et al.* (2001) reported the proportion having surgery, with or without adjuvant therapy, for NSCLC as 21% (range 8-75%). This was similar to an average figure of 19.1% reported by Cartman *et al.* (2002) from Yorkshire and South Humber in the UK, albeit that they found significant differences between health districts. In Victoria, a surgical rate of 23% was reported (Richardson *et al.*, 2000). From a review of the literature Alpard and Zwischenberger (1999) concluded that one third of all lung cancer patients and 88% of those with early stage disease underwent surgery for their lung cancer; this was similar to the proportions reported by Polednak (2001) in the US. We found that surgical intervention fractions in this study (16.7% for NSCLC and 12.4% NSCLC/SCLC) were approximately two thirds of the European rates and one half of that reported from Victoria and in the review article, but similar to those reported from Scotland and Virginia (Campbell *et al.*, 2002, Smith *et al.*, 1995). The small proportion of patients with SCLC in this study who received surgery was consistent with figures reported by Beadsmoore *et al.* (2003) of approximately one per cent. As elsewhere WA also saw a shift to less extensive surgery and away from pneumonectomy to lobectomy and resection (Waller, 2001). The less frequent use of surgery in WA may be due to a degree of medical nihilism, which may also limit rural referral practices (Cartman *et al.*, 2002, Ball *et al.*, 2000). Surgery may be accompanied by adjuvant therapy, and even then, survival is poor, which may lead medical practitioners to avoid putting patients through treatment programs that are arduous, costly and offer little prolongation of life. Alternatively, the lower rates in WA may be due to the detection of later stage disease unsuitable for surgery.

The perception of limited benefits may have been one reason patients aged over 60 years in this study underwent surgery much less often than younger patients. Cartman *et al.* (2002) similarly found that older patients were unlikely to undergo surgery, but found no gender difference. Females in our study were more likely to undergo surgery. In the US, older patients were also found to be less likely to undergo surgery, as were those who were unmarried or had more comorbidity (Greenberg *et al.*, 1988, Polednak, 2001, Smith *et al.*, 1995). Increased comorbidity, often found in more deprived groups (Auerbach *et al.*, 2001, Campbell *et al.*, 2002), may be a reason for avoidance of surgery (Waller, 2001). Our analysis adjusted for confounding by individual comorbidity and for individual and aggregated measures of disadvantage, thus the effects of fitness for treatment had been factored into the analysis. Similar findings for comorbidity have been reported from elsewhere in Australia (Richardson *et al.*, 2000).

There were low surgery rates in the indigenous population. The independent effects of socio-economic status and rurality had been allowed for in the analysis and thus factors other than poverty were likely to be involved. These could include cultural and social reasons for late diagnosis, a preference not to have surgery, or there could have been factors within the health services that reduced the likelihood of treatment, such as a reluctance to treat this group or cultural insensitivity making indigenous people prefer not to undergo treatment (Coory *et al.*, 2000, Cunningham, 2002).

This is the first study in Australia to demonstrate that social and locational disadvantage, being indigenous and not having private health insurance all serve to reduce the likelihood of receiving lung cancer surgery.

To the extent that this represents an unacceptable inequality in health care outcomes, a number of policy options are available to redress the situation, including those aimed at earlier prevention, diagnosis and referral. The nihilistic attitudes towards lung cancer held by many doctors requires attention, especially in rural areas (Ball *et al.*, 2000). Policies aimed at education of rural doctors and indigenous health services with fast tracking of their patients to multi-disciplinary teams in metropolitan centres are imperative (Richardson *et al.*, 2000, Ball *et al.*, 2000). This should be accompanied by improved cultural awareness of indigenous issues and measures to remove barriers to their access to treatment. Earlier diagnosis, especially in disadvantaged groups, is a priority.

Screening remains inappropriate (Manser *et al.*, 2003), but encouragement of the population to see their general practitioner at an earlier time in response to symptoms may be useful. It may, however, be appropriate to evaluate new screening methods, such as helical computed tomography (Elwood *et al.*, 2003), in indigenous smokers. The results of this study imply that policies specifically targeted at earlier recognition of the signs and symptoms of lung cancer, together with fast track referral systems may need to be designed and implemented in non-metropolitan Western Australia. Studies have also shown that patients treated by multi-disciplinary teams, which are more likely to exist in the metropolitan area, have a better prognosis (Cartman *et al.*, 2002). Thus, policies aimed at early referral of rural patients to these teams may be of additional value in improving treatment and survival.

The inequalities in treatment patterns found in Western Australia are disturbing in a country that prides itself on its universal system of health care. The reasons for the disparities are open to debate. Lung cancer usually has a fatal outcome following an often short but debilitating period of illness. Not only is it more common in disadvantaged groups, but also the survival is worse in those groups (Cartman *et al.*, 2002, AIHW & AACR, 2003) It is possible that the different surgical patterns reported here account for some of the decreased survival (Hall *et al.*, 2003, Cartman *et al.*, 2002).

Clinical guidelines aimed at ensuring that a multi-disciplinary team sees all lung cancer patients regardless of their geographical or socio-economic circumstances are warranted. Given that most lung cancer is smoking-related (Beadsmoore *et al.*, 2003), the continued efforts of health promoters, health care workers and others to reduce the prevalence of smoking in the community is the cornerstone to lung cancer control. Results of tobacco control policies are already being seen in the reduced incident rate of lung cancer in males (AIHW, 2002, AIHW & AACR, 2002). Future policies must also aim to support these initiatives even more vigorously.

Table 1: Surgical procedures for lung cancer by histology of carcinoma in Western Australia 1982–2001

	Pneumonectomy	Lobectomy	Segmentectomy or wedge resection	Bronchial/tracheal/ endotracheal resection	Total surgery (%)	No surgery (%)
Histology of carcinoma	n (% of total number of cases per histology)					
Adenocarcinoma (3349)	86 (3)	493 (15)	118 (4)	7 (0)	703 (21)	2645 (79)
Small cell (1842)	3 (0)	19 (1)	2 (0)	2 (0)	25 (1)	1815 (99)
Large cell (1445)	32 (2)	93 (6)	25 (2)	2 (0)	152 (11)	1293 (90)
Squamous (3121)	148 (5)	331 (11)	59 (2)	11 (0)	547 (18)	2572 (83)
Other malignancy (2951)	18 (1)	81 (3)	37 (1)	3(0)	139 (5)	2812 (95)
Total (12708)	287	1017	241	25	1570 (12)	11138 (88)

Note: in some cases they may have had prior surgery and then proceeded to more extensive surgery

Table 2: Characteristics of lung cancer patients in Western Australia in 1982-2001, showing proportions who received any lung cancer surgery

	Total per category n (%)	Surgery %	p-value
Calendar year of diagnosis (n=12708)			
1982-1986	2615 (20.6)	12.0	
1987-1991	3123 (24.6)	12.7	0.45
1992-1996	3342 (26.3)	11.7	
1997-2001	3628 (28.5)	12.9	
Age at diagnosis (n=12708)			
Age < 60years	2594 (20.4)	17.0	<0.01
Age > 60 years	10114 (79.6)	11.2	
Gender (n=12708)			
Male	8849 (69.6)	12.0	0.10
Female	3859 (30.4)	13.1	
Charlson weighted comorbidity index (n=12708)			
0	6664 (52.4)	17.6	
1-2	1661 (13.1)	14.0	<0.01
3-14	4383 (34.5)	3.7	
Marital status (n=12708)			
Never married	960 (8.6)	8.6	
Married/defacto	8064 (63.5)	13.9	
Divorced/separated	1039 (8.2)	14.5	<0.01
Widowed	2352 (18.5)	8.3	
Unknown	293 (2.3)	8.2	
Indigenous status (n=12708)			
Non-indigenous/not known	12439 (97.9)	12.4	0.12
Indigenous	269 (2.1)	9.3	
Histology of lung cancer (n=12708)			
Adenocarcinoma	3349 (26.4)	21.7	
Small cell	1842 (14.5)	1.4	
Large cell	1445 (11.4)	10.6	<0.01
Squamous	3121 (24.6)	17.6	
Other malignancy	2951 (23.2)	5.0	
Index of Relative Socio-economic Disadvantage (n=7545)			
Least disadvantaged 1	1398 (18.5)	14.2	
2	1501 (19.9)	11.8	
3	2227 (29.5)	12.7	0.10
4	1493 (19.8)	11.3	
Most disadvantaged 5	926 (12.3)	11.2	

Accessibility/remoteness Index of Australia (n=7541)			
Very accessible	6372 (84.5)	13.0	
Accessible	509 (6.7)	9.2	
Moderate accessible	385 (5.1)	8.6	<0.01
Remote	178 (2.4)	11.2	
Very Remote	99 (1.3)	5.2	
Location of hospital (n=12687)			
Metropolitan	11521 (90.8)	13.3	<0.01
Rural	1166 (9.2)	3.5	
Insurance status (n=12563)			
Public	8606 (68.5)	11.5	<0.01
Private	3957 (31.5)	14.6	
Hospital status (n=12708)			
Public	10642 (83.7)	12.3	<0.01
Private	2066 (16.3)	12.6	

Table 3: Logistic regression analysis of the likelihood of surgery after a diagnosis of lung cancer according to demographic, social and locational factors and the possession of private health insurance

Factor	Surgery	
	1982–2001 Adjusted Odds Ratio[a] (95% CI)	**1991–2001 Adjusted Odds Ratio[b] (95% CI)**
Calendar year of diagnosis		
1982-1986	1.00	N/A
1987-1991	1.14 (0.96-1.35)	1.00
1992-1996	0.95 (0.80-1.12)	0.94 (0.71-1.25)
1997-2001	1.15 (0.97-1.36)	1.16 (0.87-1.53)
Age at admission		
Per year	0.97 (0.97-0.98)	0.98 (0.97-0.98)
Gender (female)	1.16 (1.02-1.32)	1.27 (1.07-1.49)
Charlson weighted comorbidity index		
0	1.00	1.00
1-2	0.94 (0.80-1.11)	0.90 (0.73-1.11)
3-14	0.19 (0.16-0.22)	0.18 (0.14-0.23)

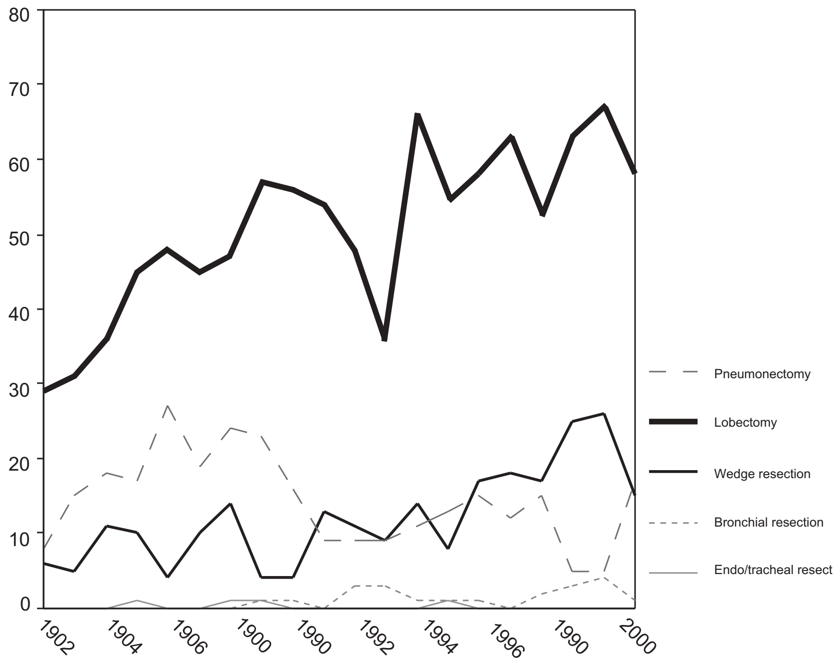
Marital status			
Never married		1.00	1.00
Married/defacto		1.81 (1.41-2.32)	1.90 (1.34-2.68)
Divorced/separated		1.84 (1.36-2.30)	1.93 (1.29-2.91)
Widowed		1.42 (1.05-1.92)	1.48 (0.99-2.22)
Unknown		1.07 (0.65-1.75)	1.27 (0.68-2.37)
Indigenous status (yes)		0.62 (0.40-0.96)	0.63 (0.33-1.21)
Histology of carcinoma			
Adenocarcinoma		1.00	1.00
Small cell		0.05 (0.04-0.08)	0.03 (0.02-0.06)
Large cell		0.45 (0.37-0.55)	0.42 (0.33-0.54)
Squamous		0.78 (0.68-0.89)	0.80 (0.67-0.95)
Other malignancy		0.20 (0.17-0.25)	0.23 (0.17-0.29)
Index of Relative Socio-economic Disadvantage (IRSD) 1991-2001 only[c]			
Least disadvantaged	1	1.00	1.00
	2	0.79 (0.63-0.99)	0.86 (0.67-1.09)
	3	0.88 (0.71-1.09)	0.97 (0.78-1.21)
	4	0.78 (0.61-0.99)	0.82 (0.64-1.04)
Most disadvantaged	5	0.79 (0.60-1.04)	0.86 (0.65-1.14)
Accessibility/remoteness Index of Australia (ARIA) 1991-2001 only[c]			
Very accessible		1.00	1.00
Accessible		0.73 (0.53-1.02)	1.17 (0.82-1.68)
Moderate accessible		0.62 (0.42-0.92)	0.88 (0.59-1.32)
Remote		0.94 (0.57-1.56)	1.44 (0.85-2.44)
Very Remote		0.36 (0.14-0.92)	0.44 (0.17-1.14)
Location of hospital (rural)		0.26 (0.19-0.36)	0.28 (0.18-0.43)
Insurance status (private)		1.15 (1.02-1.30)	1.21 (0.89-1.35)
Hospital type (private)		0.99 (0.85-1.16)	0.93 (0.74-1.18)

Note[a]; for the adjusted OR 1982-2001, each factor was adjusted for age, Box-Tidwell transformation of age, calendar period, Charleson index, histology group, indigenous status and marital status, except where it was the factor of interest.

Note[b]; for the adjusted OR 1991-2001, each factor was adjusted as above plus ARIA, IRSD, location of hospital, hospital status and insurance status except where it was the factor of interest.

Note[c]; as the IRSD and ARIA were only available from 1991 onwards the demographically adjusted model is for the years 1991-2001 only

Figure 1: Pattern of inpatient surgical care for lung cancer in Western Australia 1982–2000



Acknowledgements

The authors thank the Western Australian Data Linkage Unit for their assistance with the provision of data and advice for this research. Ms Hall was supported by an NHMRC postgraduate research scholarship.

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