Title: Patterns of care and emergency presentations for people with non-small cell lung cancer in New South Wales, Australia: a population-based study

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ABSTRACT

Introduction: Little is known about population-wide emergency presentations and patterns of care for people diagnosed with non-small cell lung cancer (NSCLC) in Australia. We examined patients' characteristics associated with presenting to an emergency department around the time of diagnosis ("emergency presenters"), and receiving anti-cancer treatment within 12 months of diagnosis.

Materials and Methods: Participants in the 45 and Up Study who were newly diagnosed with NSCLC during 2006-2010 were included. We used linked data from population-wide health databases including Medicare and pharmaceutical claims, inpatient hospitalisations and emergency department presentations to follow participants to June 2014. Patients' characteristics associated with being an emergency presenter and receiving any anti-cancer treatment were examined.

Results: A total of 647 NSCLC cases were included (58.6% male, median age 73 years). Emergency presenters (34.5% of cases) were more likely to have a high Charlson comorbidity index score, be an ex-smoker who had quit in the past 15 years and to be diagnosed with distant metastases. Almost all patients had visited their general practitioner ≥3 times in the 6 months prior to diagnosis. Nearly one-third (29.5%) of patients did not receive any anti-cancer treatment, however, there were no differences between emergency and non-emergency presenters in the likelihood of receiving treatment. Those less likely to be treated were older, had no private health insurance, and had unknown stage disease recorded.

Conclusion: Our results indicate the difficulties in diagnosing lung cancer at an early stage and inequities in NSCLC treatment. Future research should address opportunities to diagnose lung cancer earlier and to optimise treatment pathways.

Keywords
Non-small cell lung cancer; Patterns of care; Cancer treatment; Emergency presentation

Highlights

- 34% of non-small cell lung cancer cases presented to an emergency department around diagnosis.
- Nearly one-third (30%) of all NSCLC patients did not receive any anti-cancer treatment.
- There were no differences in the likelihood of receiving treatment by emergency status.

1. INTRODUCTION

Lung cancer is the leading cause of cancer death worldwide. In Australia, approximately 47,750 people died from cancer in 2017, with 19% of these due to lung cancer.[1] This number is higher than the combined number of deaths from the next two leading causes of cancer death, colorectal and prostate cancer.[1] Survival relative to the general population one and two years after a lung cancer diagnosis is 39% and 25% respectively.[2] For many lung cancer patients, poor survival is attributable to being diagnosed at an advanced stage.[3]

The pathways to a lung cancer diagnosis are complex, due to these patients generally having a number of comorbidities and non-specific symptoms leading to diagnostic difficulty and delays in diagnosis.[4, 5] A lengthy time interval from first symptomatic presentation to diagnosis often involves multiple GP consultations to rule out differential diagnoses.[6] One of the main pathways to diagnosis for lung cancer patients is presentation to an emergency department and this has been associated with poorer outcomes in the United Kingdom (UK), usually because the disease had progressed to an advanced stage.[7-10]

In addition to advanced stage disease at diagnosis limiting the opportunity for curative treatment, the treatment pathway is complex due to the disparities in guideline recommended treatment and treatment received in practice.[4, 11] In developed countries this is often because patients included in lung cancer clinical trials on which the guidelines are based, are not representative of the general lung cancer population who tend to be older, have more comorbidities and poorer performance status.[4, 11, 12] Timeliness of initial treatment from diagnosis has also been shown to vary.[4] In Australia, those treated in public hospitals and who were older experienced the greatest delays in time to initial treatment and management.[13] Additionally, underutilization of lung cancer treatments have been reported in various countries.[4, 12]

Despite the diagnostic route playing a critical role in disease progression and providing an opportunity for early intervention and curative treatments, there is limited evidence in Australia about the emergency route to a lung cancer diagnosis. Previous studies have focussed on the application and impact of treatments for NSCLC[11] and the timeliness of treatment after diagnosis in Australia.[13]

This study aimed to provide greater understanding of the patterns of care for people newly diagnosed with non-small cell lung cancer (NSCLC) in New South Wales (NSW), Australia's most populous state, using a large population-based cohort with linked data from several health databases. We ascertained the proportion of NSCLC cases with an emergency presentation around the time of diagnosis, the types of initial treatment(s) received after diagnosis and patients' characteristics associated with these outcomes.

2. MATERIALS AND METHODS

2.1 Study sample

The Sax Institute's 45 and Up Study is a cohort of around 267, 000 people in NSW, Australia aged 45 years and older. Participants were randomly sampled from the Department of Human Services (formerly Medicare Australia) enrolment database that has almost complete coverage of the population, including all citizens and permanent residents of Australia. Overall, the 45 and Up Study sample represents approximately 11% of the NSW population aged 45 years and older. Study participants completed a baseline questionnaire between January 2006 and December 2009 and consented to linkage of their records to population-wide health databases. The baseline questionnaire included measures of health status, health related behaviours, socio-demographic information and past medical history. Details of the study cohort and methods are described elsewhere.[14]

The conduct of the 45 and Up Study was approved by the University of New South Wales Human Research Ethics Committee. The NSW Population and Health Services Research Ethics Committee (approval number 2014/08/551) approved the record linkage and analysis reported here.

2.2 Data sources and probabilistic record linkage

Baseline questionnaire data from study participants were linked to a number of population-wide health databases. This included information on: (1) the use of subsidised prescription drugs in the Pharmaceutical Benefits Scheme (PBS; Jun 2004 to Dec 2014) and (2) the use of outpatient medical services and some in-hospital procedures in the Medicare Benefits Schedule (MBS; Jun 2004 to Dec 2014) which are both administered and supplied by the Department of Human Services; (3) patient care delivered in public and private hospitals in the Admitted Patient Data Collection (APDC; July 2001 to June 2014); (4) emergency presentations to public hospitals in the Emergency Department Data Collection (EDDC; Jan 2005 to Dec 2014); (5) cancer diagnoses recorded in the NSW Cancer Registry (NSWCR; Jan 1994 to Dec 2010) which contains all notifications of primary cancer diagnosed or treated in NSW; (6) vital status recorded in the Register of Births, Deaths and Marriages (RBDM; Feb 2006 to Dec 2014) covers all deaths that occur in NSW; and (7) cause of death recorded in the Australian Coordinating Registry Cause of Death Unit Record File (COD-URF; Feb 2006 to Dec 2012). Individual records were linked to health databases (1) and (2) by the Sax Institute using a unique identifier that was provided to the Department of Human Services, while individual records in databases (3) to (7) were probabilistically linked by the Centre for Health Record Linkage[15] using a best practice approach to linkage while preserving privacy.[16]

2.3 Inclusion and exclusion criteria for people with NSCLC

There were 220 participants who were excluded because they entered the study in 2005 (i.e. the pilot study) or had linkages to health databases that could not be resolved (e.g. hospital admissions occurring after the recorded date of death). Of the remaining 266,794 participants, those with an incident (i.e. newly diagnosed) lung cancer up to 31 December 2010 were identified in the NSWCR dataset. We defined incident cancers as those diagnosed from the month of cohort entry onwards as day of diagnosis was not available in the NSWCR dataset. Lung cancers were coded as C34 based on the tenth revision of the International Classification of Diseases, Australian Modification (ICD10-AM). The two broad histological types of lung cancer, non-small cell lung cancer (NSCLC) and small cell lung cancer (SCLC) were differentiated based on the morphology codes from the third edition of the International Classification of Diseases for Oncology (ICD-O-3). Patients with a diagnosis of SCLC or who were missing responses for any of the characteristics of interest were excluded from the analyses.

2.4 Characteristics of people with NSCLC

Stage of disease at diagnosis was obtained from the NSWCR summary degree of spread grouping, which classifies the extent of spread as being: (1) localised; (2) regional spread to adjacent organs and/or regional lymph nodes; (3) distant metastases; or (4) unknown.

Socio-demographic characteristics analysed were age at diagnosis, gender, place of residence, education, country of birth, private health insurance and married or de-facto status (Table 1). Health characteristics that were self-reported at the time of completing the baseline questionnaire included smoking status, body mass index (BMI (kg/m^2)), the degree of physical function using the physical functioning component of the medical outcomes scale (MOSPF-10)[17, 18] or a medical history of heart disease and diabetes. The presence of non-cancer comorbidities was measured using the Charlson Comorbidity Index (CCI) score derived from diagnosis codes in hospital admissions records.[19] Comorbidities that were recorded up to 5 years prior to diagnosis and up to 6 months after diagnosis were included.

2.5 Health services use

The number of General Practitioner (GP) consultations recorded in the MBS[20] was measured for two time intervals: (1) in the month of or the month prior to diagnosis and (2) up to 6 months prior to diagnosis.

Patients who were potentially diagnosed through an emergency route were identified as those who had presented to an emergency department in the month of or the month prior to diagnosis (i.e. 'emergency presenters').

The receipt of anti-cancer treatment was defined as lung cancer-specific treatment received in the first 12 months after diagnosis, including surgery, radiotherapy and systemic therapy (Table 2). Treatment combinations by stage of disease were based on the Australian Clinical Practice Guidelines for the Treatment of NSCLC.[21]

2.6 Statistical analysis

Differences in patients' characteristics by stage of disease were tested using Pearson's chi-squared test of association.

To identify patients' characteristics associated with being an emergency presenter, odds ratios (ORs) with 95% confidence intervals (CIs) were estimated using multivariable logistic regression. The association between each patient characteristic and emergency presentation was initially estimated separately (unadjusted) and then ORs were adjusted for all characteristics described in section 2.4.

The time interval from diagnosis to initial treatment (months) was defined from the date of diagnosis up to the date of the first treatment, taking the first day of the month as the day of diagnosis as only month and year of diagnosis were available for analysis. For patients who did not receive treatment in the first 12 months after diagnosis, the interval was calculated from the date of diagnosis up to the date the patient died or the date at the end of the follow up (i.e. 12 months after diagnosis), according to which occurred first. The median time and inter-quartile range (IQR) from diagnosis to first treatment were estimated overall and for each group using the Kaplan-Meier method. Patients who did not receive treatment were censored. To identify patients' characteristics associated with likelihood of receiving treatment, hazard ratios (HRs) with 95% CIs were estimated using Cox's proportional hazards (PH) regression. The association between each patient characteristic and time to initial treatment was estimated separately (unadjusted) and then HRs were adjusted for all characteristics. The PH assumption was checked using scaled Schoenfeld residuals and the overall goodness of fit measure assessed using Cox-Snell residuals. The global test for the fully-adjusted model showed the PH assumption was met ($p=0.215$).

Survival time after diagnosis was defined from the date of diagnosis up to the date of death. For patients who did not die during the follow-up period, they were censored at the end of follow-up time, which was 31 December 2014 for overall survival and 31 December 2012 for lung cancer specific survival. Overall and lung cancer specific survival at 1 and 2-years after diagnosis was estimated using the Kaplan-Meier method. For calculating lung cancer specific survival, patients who died from other causes were censored at the date of death.

Most analyses were conducted in SAS version 9.4 (SAS Institute Inc, Cary, NC). The proportional hazards assumption and overall goodness of fit were checked using STATA 12 (StataCorp, College Station, TX).

3. RESULTS

3.1 Patient sample

There were 817 people in the cohort with an incident lung cancer recorded in the NSWCR from baseline to Dec 2010. Of these, 83 had SCLC and 87 had missing responses for characteristics of interest and were excluded. The final complete case analyses included 647 people with NSCLC.

People diagnosed with NSCLC had a median time from baseline to diagnosis of 17.0 months (IQR: 9.1-26.4), median age at diagnosis of 73 years (IQR: 65-80 years), 58.6% were male and 41.7% had a CCI score of ≥1 (Table 1). At diagnosis 142 (21.9%) cases had localised disease, 131 (20.2%) had regional spread, 250 (38.6%) had distant metastases and 124 (19.2%) had unknown spread of disease recorded. Of the patients' characteristics analysed, only age at diagnosis (p=0.001) and gender (p=0.038) varied by stage of disease. Patients who were older were more likely to have unknown stage disease. Males were more likely to have distant or unknown spread compared to regional stage disease.

Overall survival at one and two years after diagnosis was 48.4% and 34.2% respectively, and lung cancer specific survival was 53.0% and 39.4% respectively.

3.2 Emergency presentation around time of diagnosis

In total, 223 (34.5%) patients presented to an emergency department up to one month prior to or in the month of diagnosis. In the adjusted analyses (Figure 1), characteristics associated with being an emergency presenter were stage of disease at diagnosis (p<0.001), CCI score (p<0.001) and smoking status (p=0.028). Patients were more likely to be an emergency presenter if they were diagnosed with distant metastases (OR=2.65; 95% CI: 1.62-4.31) compared to localised disease, had CCI score of 1-2 (OR=2.07; 95% CI: 1.36-3.13) or ≥3 (OR=3.86; 95% CI: 2.18-6.84) compared to no comorbidities (CCI score=0) or were ex-smokers who quit in the last 15 years (OR=1.80; 95% CI: 1.16-2.78) compared to never or ex-smokers who quit more than 15 years ago. There were no differences between emergency presenters and non-emergency presenters in the number of GP visits in the month of or the month prior to diagnosis. Overall, 595 (92%) patients had visited their GP ≥3 times in the 6 months prior to diagnosis.

3.3 Receipt of anti-cancer treatment

In total, 456 (70.5%) patients received anti-cancer treatment in the first 12 months after diagnosis with a median time to treatment of 1.8 months (IQR: 1.1-3.9 months) (Table 2). Systemic therapy plus radiotherapy was received by 17.5% of patients, 16.7% had lung surgery only, 14.8% had radiotherapy only, 12.5% had systemic therapy only, 6.3% had lung surgery plus systemic therapy and/or radiotherapy and 2.6% had brain surgery (for metastases) with or without systemic therapy and/or radiotherapy and/or lung surgery. The remaining 191 (29.5%) patients did not receive any treatment, which ranged from 14.5% of patients with regional spread to 46.8% of patients with unknown spread of disease.

Lung surgery alone was carried out for 50.7% of patients with localised disease, 24.4% with regional spread and very few patients with distant metastases or unknown spread. Radiotherapy, systemic therapy and the combination of these therapies were received more frequently by patients with regional spread (46.6%), distant metastases (57.6%) and unknown spread (46.8%) compared to those with localised (19.0%) disease. Brain surgery with or without systemic therapy and/or radiotherapy and/or lung surgery was carried out for 5.2% of patients with distant metastases.

3.4 Characteristics associated with receipt of anti-cancer treatment

In the adjusted analyses, characteristics associated with receipt of anti-cancer treatment in the first 12 months after diagnosis were age at diagnosis (p<0.001), private health insurance (p<0.001) and stage of disease at diagnosis (p=0.005) (Figure 2). Patients were less likely to receive treatment if they were aged 70-79 years at diagnosis (HR=0.76; 95% CI: 0.60-0.95) or 80 years and older (HR=0.35; 95% CI: 0.25-0.47) compared to those aged 60-69 at diagnosis, if they had no private health insurance (HR=0.69; 95% CI: 0.56-0.84) or were recorded as having unknown stage (HR=0.63; 95% CI: 0.46-0.86) compared to localised disease. There were no differences between emergency presenters and non-emergency presenters in the likelihood of receiving treatment (p=0.145).

4. DISCUSSION

This is one of the most comprehensive population-wide patterns of care studies for NSCLC patients in Australia. Access to almost complete coverage of the healthcare system allowed for examination of the patient's journey from the emergency route to a NSCLC diagnosis to initial treatment. Additionally, access to comprehensive health and socio-demographic information obtained from questionnaire data allowed us to identify significant variation in these outcomes by individual patients' characteristics. Our main findings reflect the difficulties in diagnosing lung cancer at an early stage and have identified inequities in NSCLC treatment.

4.1 Emergency presentation around time of diagnosis

More than one-third of NSCLC patients presented to an emergency department around the time of diagnosis. Emergency presenters had poorer health characteristics, including a high comorbidity score or were more recent ex-smokers. There were some suggestions people who were older and less educated were more likely to be an emergency presenter, although these associations were not statistically significant after adjustment for confounders. Almost all patients visited their GP several times in the 6 months prior to their diagnosis, suggesting emergency presenters were not using the emergency department as their primary point of contact but were also utilising other healthcare channels prior to diagnosis. Emergency presenters were also more likely to be diagnosed with advanced stage disease.

The proportion of patients in our study who were emergency presenters was similar to that reported in the UK: in England and Scotland approximately 39% of all lung cancer patients were diagnosed as a result of a presentation to the emergency department.[7, 9, 22] Similarly, a New Zealand study reported that 35% of lung cancer cases first presented at an emergency department.[23] Patients' characteristics associated with an emergency diagnosis include being older or female and having poorer performance status or lower socioeconomic status, as reported in studies from England and USA.[10] One English study reported no association with comorbidities,[24] whereas a US study reported those with higher comorbidities were more likely to have an emergency diagnosis.[25] Three English studies have shown symptoms related to an emergency diagnosis of lung cancer are often complicated due to patients having comorbid conditions such as chronic obstructive pulmonary disease (COPD), they may present with non-specific symptoms or symptoms unrelated to the lung cancer and then lung cancer is an incidental finding.[5, 8, 26] It is likely the complexities of these presentations are applicable in our study given emergency presenters had poorer health characteristics. We found recent ex-smokers (i.e. quit within the past 15 years) were more likely to be emergency presenters than longer term ex-smokers or never smokers. It is possible recent ex-smokers had a range of symptoms that made a timely diagnosis of lung cancer difficult as other diagnoses were ruled out. To our knowledge, no other study has investigated the association between smoking history and the emergency route to a lung cancer diagnosis. In England, lung cancer patients diagnosed via an emergency presentation had more advanced stage disease[27] and poorer survival.[9]

A small number of interventions to improve early detection in both asymptomatic and symptomatic populations are being developed and tested in the lung cancer setting. For example, a risk assessment tool used within the context of a US lung cancer screening trial for identifying ever smokers at high risk for lung cancer was also good at predicting lung cancer incidence in the 45 and Up Study Australian population.[28] The tool identifies individuals at high risk of developing lung cancer over six years based on their smoking history, demographic and health related characteristics. Future work could examine whether use of this tool to identify high risk individuals reduces the proportion of emergency presenters. Other early detection interventions include the CHEST intervention that facilitates early presentation with symptoms in primary care,[29, 30] and a referral decision prompt that supports GPs to provide early referral of people with a suspicious lesion to specialist respiratory care.[31]

4.2 Receipt of anti-cancer treatment

In total, 70% of all patients received anti-cancer treatment in the first 12 months after diagnosis with median time from diagnosis to treatment of 1.8 months (IQR: 1.1-3.9). The types of anti-cancer treatment received varied considerably with stage of disease and appear to be in concordance with the Australian Clinical Practice guidelines.[21] However, there were 30% of patients who did not receive any

treatment, including 20% of patients with localised disease. Those less likely to receive treatment were older, had no private health insurance or were recorded with unknown spread of disease. After adjusting for these characteristics, there were no significant differences between emergency and non-emergency presenters in the likelihood of receiving treatment.

Similar levels of non-treatment for lung cancer have been reported previously,[4, 12] with two Australian studies estimating a third of all patients had not received any active anti-cancer treatment, and this proportion had not changed from 1996 to 2002.[32, 33] Another Australian study reported that 26% of cases in 2003 had no anti-cancer treatment.[34] We found about 30% of patients were not treated between 2006 and 2011, suggesting no substantial changes in the provision of lung cancer treatment for NSCLC patients over time. The proportion of lung cancer patients that have no anti-cancer treatment has varied significantly across countries, from 18% of patients in the USA to 50% in New Zealand and Ireland.[23, 35] One Australian study found the actual proportion of lung cancer patients who were not treated was five times greater than that recommended in guidelines and two times greater than that recommended by a multidisciplinary team who reviewed each patient's treatment options.[35] Additionally, the optimal radiotherapy utilization rates for lung cancer at initial diagnosis have been estimated at 45 to 68%.[4, 36] In our study, 38% of people with NSCLC received radiotherapy, which is lower than the 43% previously reported in NSW.[37]

Previous Australian studies reported similar characteristics associated with not receiving treatment, such as older age, having distant metastases or unknown stage disease, and among those who had experienced weight loss.[11, 13, 33] We found that among cases without private health insurance, the median time from diagnosis to initial treatment was 2.2 months (IQR: 1.2-7.4) compared with 1.4 months (IQR: 0.9-2.5) for those with private health insurance. These findings are similar to an Australian study that found those treated in public hospitals experience longer waiting times compared to those treated in private hospitals.[13] European studies have reported time from diagnosis to initial treatment vary between 30 and 84 days with several studies reporting times exceeding recommendations in international guidelines.[38] The UK National Health Service (NHS) Cancer Plan guideline and RAND corporation recommend a maximum time from diagnosis to treatment of 31 and 42 days, respectively.[38] Our estimate of 2.2 months for patients without private health insurance exceeds both recommended guidelines.

4.3 Limitations

Our study includes a cohort of patients recruited in the 45 and Up Study sample, and not the whole NSW population. There was a smaller proportion of patients with distant metastases (38.6% versus 46.2%) [39] and there was a higher proportion who were Australian-born and female compared to other NSW based studies.[11, 32, 33, 40] However, it has been demonstrated that associations estimated within the 45 and Up Study cohort yield estimates similar to those from other NSW based studies.[41] Our results are consistent with other studies investigating similar associations, indicating they are reliable estimates.

A further limitation is that we could not directly infer from our data that patients who visited the emergency department in the month of or month prior to diagnosis were diagnosed as a result of the emergency presentation. Some patients may have been undergoing investigation of their symptoms with their GP but had an acute exacerbation of symptoms requiring presentation to an emergency department which may or may not have hastened the diagnosis. We also did not have access to more detailed TNM staging and Eastern Cooperative Oncology Group (ECOG) performance status on which treatment recommendations are based in the Australian Clinical Practice guidelines.[21] Finally, 19% had unknown stage disease recorded in the NSWCR due to insufficient information being available in the notifications received to assign stage. Therefore we could only describe general patterns of treatment and how this roughly compares with the guidelines.

5. CONCLUSIONS

In this population-based study, we found that about one-third of lung cancer patients were emergency presenters, who had poorer health characteristics including more comorbid conditions and/or were recent ex-smokers and were also more likely to be diagnosed with advanced stage disease. However, there were no differences between emergency and non-emergency presenters in the likelihood of receiving initial anti-cancer treatment and management for lung cancer. Patients who had no private health insurance or were older at diagnosis were less likely to receive treatment, indicating there may be some inequities in NSCLC treatment. Future work identifying earlier detection methods for lung cancer and optimising treatment pathways has the potential for improving outcomes for lung cancer patients.

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CONFLICT OF INTEREST STATEMENT

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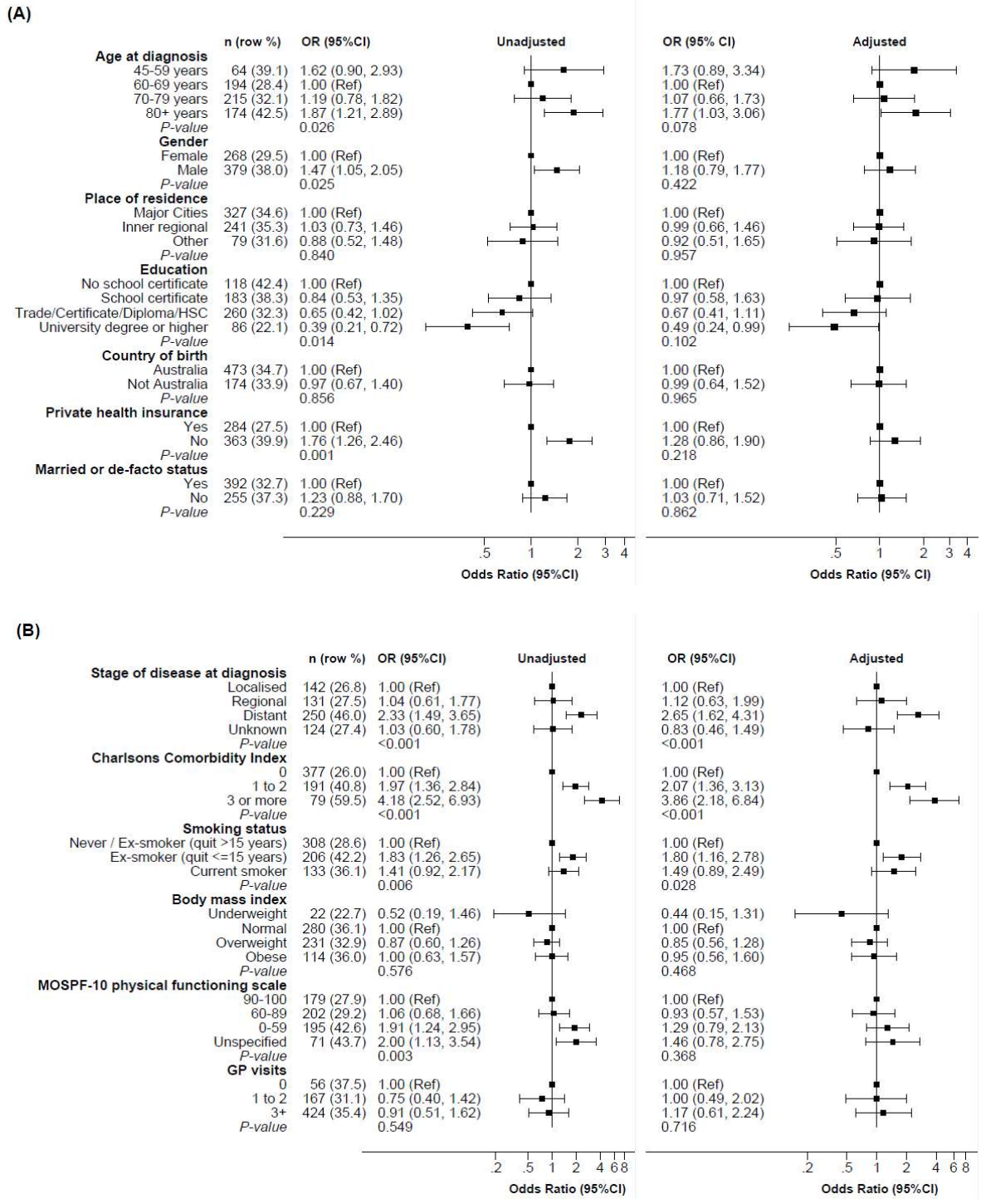
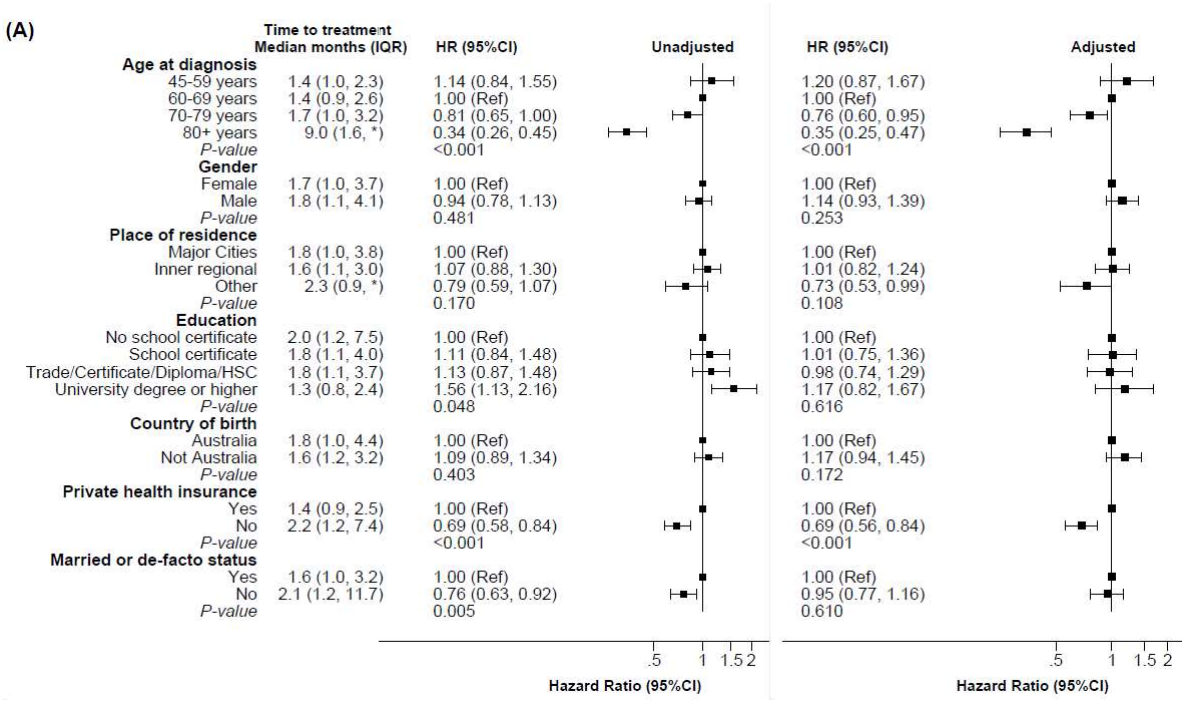
FIGURES

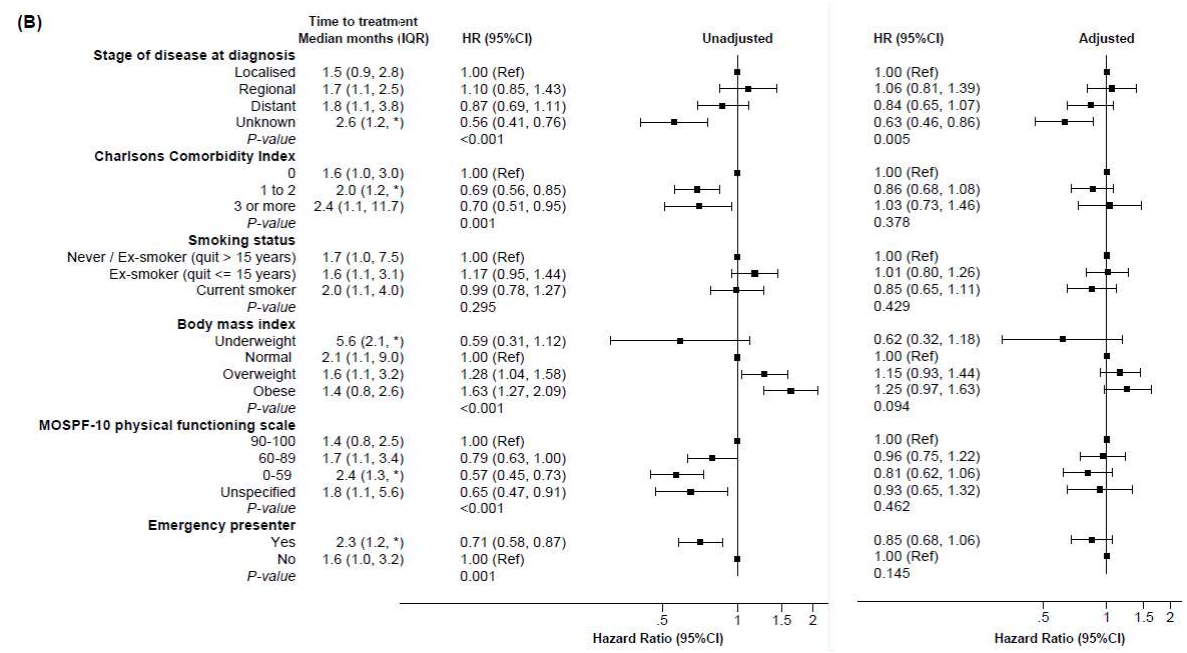
Figure 1. Unadjusted and adjusted odds ratios and 95% confidence intervals for (A) socio-demographic and (B) health characteristics associated with being an emergency presenter. The adjusted odds ratios were adjusted for all characteristics in Figure 1A and B.



OR: Odds Ratio; CI: Confidence Interval; GP visits: General Practitioner consultations in the month of or the month prior to diagnosis

Figure 2. Unadjusted and adjusted hazard ratios and 95% confidence intervals for (A) socio-demographic and (B) health characteristics associated with receipt of anti-cancer treatment. The adjusted hazard ratios were adjusted for all characteristics in Figure 2A and B.





** 75th percentile not reported as largest observation was censored.*
HR: Hazard Ratio; CI: Confidence Interval; IQR: Inter-Quartile Range

TABLES

Table 1: Characteristics of people with non-small-cell lung cancer diagnosed in 2006-2010 by stage of disease.

Characteristics	All NSCLC (N=647) n (col %)	Localised disease (N=142) n (col %)	Regional disease (N=131) n (col %)	Distant disease (N=250) n (col %)	Unknown disease (N=124) n (col %)
Age at diagnosis					
45 to 59 years	64 (9.9)	*	14 (10.7)	35 (14.0)	*
60 to 69 years	194 (30.0)	41 (28.9)	47 (35.9)	70 (28.0)	36 (29.0)
70 to 79 years	215 (33.2)	58 (40.8)	41 (31.3)	82 (32.8)	34 (27.4)
80+ years	174 (26.9)	*	29 (22.1)	63 (25.2)	*
P-value				*0.001*	
Gender					
Male	379 (58.6)	83 (58.5)	63 (48.1)	153 (61.2)	80 (64.5)
Female	268 (41.4)	59 (41.5)	68 (51.9)	97 (38.8)	44 (35.5)
P-value				*0.038*	
Place of residence					
Major cities	327 (50.5)	73 (51.4)	67 (51.1)	126 (50.4)	61 (49.2)
Inner regional	241 (37.2)	49 (34.5)	50 (38.2)	95 (38.0)	47 (37.9)
Other (outer regional, remote, very remote)	79 (12.2)	20 (14.1)	14 (10.7)	29 (11.6)	16 (12.9)
P-value				*0.976*	
Education					
No school certificate	118 (18.2)	28 (19.7)	21 (16.0)	44 (17.6)	25 (20.2)
School certificate	183 (28.3)	44 (31.0)	37 (28.2)	66 (26.4)	36 (29.0)
Trade/Certificate/Diploma/HSC	260 (40.2)	55 (38.7)	57 (43.5)	101 (40.4)	47 (37.9)
University degree or higher	86 (13.3)	15 (10.6)	16 (12.2)	39 (15.6)	16 (12.9)
P-value				*0.908*	
Country of birth					
Australia	473 (73.1)	105 (73.9)	102 (77.9)	176 (70.4)	90 (72.6)
Not Australia	174 (26.9)	37 (26.1)	29 (22.1)	74 (29.6)	34 (27.4)
P-value				*0.474*	
Private health insurance at baseline					
Yes	284 (43.9)	65 (45.8)	62 (47.3)	104 (41.6)	53 (42.7)
No	363 (56.1)	77 (54.2)	69 (52.7)	146 (58.4)	71 (57.3)
P-value				*0.698*	
Married or defacto status at baseline					
Yes	392 (60.6)	99 (69.7)	75 (57.3)	150 (60.0)	68 (54.8)
No	255 (39.4)	43 (30.3)	56 (42.7)	100 (40.0)	56 (45.2)
P-value				*0.062*	
Charlson's comorbidity index score					
0	377 (58.3)	82 (57.7)	73 (55.7)	161 (64.4)	61 (49.2)
1 to 2	191 (29.5)	44 (31.0)	45 (34.4)	58 (23.2)	44 (35.5)
3 or more	79 (12.2)	16 (11.3)	13 (9.9)	31 (12.4)	19 (15.3)

Characteristics	All NSCLC (N=647) n (col %)	Localised disease (N=142) n (col %)	Regional disease (N=131) n (col %)	Distant disease (N=250) n (col %)	Unknown disease (N=124) n (col %)
P-value				*0.083*	
Smoking status at baseline					
Never / Ex-smoker (quit > 15 years)	308 (47.6)	68 (47.9)	68 (51.9)	112 (44.8)	60 (48.4)
Ex-smoker (quit ≤ 15 years)	206 (31.8)	41 (28.9)	38 (29.0)	84 (33.6)	43 (34.7)
Current smoker	133 (20.6)	33 (23.2)	25 (19.1)	54 (21.6)	21 (16.9)
P-value				*0.707*	
Body mass index (kg/m^2) at baseline					
Underweight (<18.5)	22 (3.4)	*	7 (5.3)	8 (3.2)	*
Normal range (18.5 to <25)	280 (43.3)	58 (40.8)	55 (42.0)	108 (43.2)	59 (47.6)
Overweight (25 to <30)	231 (35.7)	53 (37.3)	41 (31.3)	96 (38.4)	41 (33.1)
Obese (≥30)	114 (17.6)	*	28 (21.4)	38 (15.2)	*
P-value				*0.700*	
MOSPF-10 physical functioning scale at baseline					
0-59 (low physical function)	195 (30.1)	41 (28.9)	40 (30.5)	65 (26.0)	49 (39.5)
60-89	202 (31.2)	46 (32.4)	42 (32.1)	83 (33.2)	31 (25.0)
90-100 (high physical function)	179 (27.7)	41 (28.9)	37 (28.2)	71 (28.4)	30 (24.2)
Unspecified	71 (11.0)	14 (9.9)	12 (9.2)	31 (12.4)	14 (11.3)
P-value				*0.459*	
Heart disease at baseline					
Yes	126 (19.5)	29 (20.4)	27 (20.6)	40 (16.0)	30 (24.2)
No	521 (80.5)	113 (79.6)	104 (79.4)	210 (84.0)	94 (75.8)
P-value				*0.275*	
Diabetes at baseline					
Yes	87 (13.4)	21 (14.8)	19 (14.5)	30 (12.0)	17 (13.7)
No	560 (86.6)	121 (85.2)	112 (85.5)	220 (88.0)	107 (86.3)
P-value				*0.849*	

** Numbers not shown due to small cell sizes*
Col: Column; HSC: Higher School Certificate; NSCLC: Non-Small-Cell Lung Cancer; MOSPF-10: Medical Outcomes Study Physical Functioning scale

Table 2. Types of anti-cancer treatment received in the first 12 months after non-small-cell lung cancer diagnosis by stage of disease

Treatment	All NSCLC (N=647) n (col %)	Localised disease (N=142) n (col %)	Regional disease (N=131) n (col %)	Distant disease (N=250) n (col %)	Unknown disease (N=124) n (col %)
Lung surgery	108 (16.7)	72 (50.7)	32 (24.4)	*	*
Radiotherapy	96 (14.8)	12 (8.5)	17 (13.0)	43 (17.2)	24 (19.4)
Systemic Therapy[1]	81 (12.5)	5 (3.5)	15 (11.5)	42 (16.8)	19 (15.3)
Systemic Therapy[1] + Radiotherapy	113 (17.5)	10 (7.0)	29 (22.1)	59 (23.6)	15 (12.1)
Lung surgery + Systemic Therapy[1] and/or Radiotherapy	41 (6.3)	14 (9.9)	*	*	*
Brain surgery ± Systemic Therapy[1] and/or Radiotherapy and/or Lung surgery	17 (2.6)	0 (0.0)	*	13 (5.2)	*
No anti-cancer treatment	191 (29.5)	29 (20.4)	19 (14.5)	85 (34.0)	58 (46.8)

[1] Systemic therapy includes chemotherapy and/or targeted therapy

** Numbers not shown due to small cell sizes*

Col; Column, NSCLC; Non-Small-Cell Lung Cancer