Survival Status of Veterans with Lung Cancer Is Poorer Than That Among Civilians Due to Age and Sex Differences: A Study of Chinese Veterans in Taiwan

Yuh-Min Chen[1,2]*, Kuei-Chih Lin[3], Chun-Ming Tsai[1,2], Reury-Perng Perng[1,2]

[1]*Department of Chest Medicine and* [3]*Cancer Center, Taipei Veterans General Hospital, and* [2]*National Yang-Ming University School of Medicine, Taipei, Taiwan, R.O.C.*

Background: This study was undertaken to analyze and compare the clinical characteristics and survival difference among veterans and civilians in Taiwan with lung cancer, especially non-small-cell lung cancer, and to determine whether or not veterans have a poorer prognosis than civilians.

Methods: We retrospectively reviewed the medical records and computer files of lung cancer patients diagnosed between 1996 and 2000 at our hospital. Patients' clinical characteristics, marital status, staging, treatment modality, and overall survival were analyzed and compared, based on the patients' standing as veterans or civilians.

Results: During this period, 3,727 lung cancer patients (2,386 veterans, 1,341 civilians) were diagnosed. The overall survival of all lung cancer patients showed that civilians had better survival than veterans (median, 12 months *vs.* 8 months, $p < 0.001$). Survival of non-small-cell lung cancer patients was also better for civilians than veterans (median, 13 months *vs.* 9 months, $p < 0.001$). Surgery was the main treatment modality in both stage I and II civilians and veterans. A greater proportion of veterans in stage II and III received radiotherapy than civilians in the same stage, with a statistically significant difference in stage III patients ($p < 0.001$). Multivariate survival analysis showed that age and sex were independent risk factors for mortality, while standing (veteran or civilian) was not, in both all lung cancers and non-small-cell lung cancer alone.

Conclusion: Veterans, who mainly came from China, had a poorer prognosis than civilians when suffering from lung cancer in Taiwan, due to age and gender, rather than standing. [*J Chin Med Assoc* 2008;71(6):286–293]

Key Words: civilian, lung cancer, survival, veteran

Introduction

Lung cancer is the leading cause of cancer death in Taiwan, and Taipei Veterans General Hospital is the leading hospital in the diagnosis and treatment of lung cancer in Taiwan, for both civilians and veterans. Lung cancer is also the major cause of cancer death in North America and is even more common among veterans there.[1]

A retrospective review of 12 original research papers and meta-analyses explored whether patients' socioeconomic status influenced doctor-patient communication, and the results showed that patients from higher social classes communicated more actively and showed more affective expressiveness, eliciting more information from their doctor. In contrast, patients from lower social classes were often disadvantaged because of the doctor's misperception of their desire and need for information, and their ability to take part in the care process. More effective communication could be established by both doctors and patients through doctors' awareness of the contextual communicative differences, and by empowering patients to express concerns and preferences.[2]

Veterans affairs is an important issue in Taiwan since the Kuomintang (KMT) brought about 500,000–600,000 soldiers from China to Taiwan after their defeat

*Correspondence to: Dr Yuh-Min Chen, Department of Chest Medicine, Taipei Veterans General Hospital, 201, Section 2, Shih-Pai Road, Taipei 112, Taiwan, R.O.C.
E-mail: ymchen@vghtpe.gov.tw • Received: June 29, 2007 • Accepted: May 5, 2008

by the Chinese Communist Party army and retreat to Taiwan in 1949. In addition, they continued to enlist soldiers for decades after arriving in Taiwan, to balance forces across the Taiwan Strait. The army in Taiwan supplied discounted or free cigarettes to the soldiers during this period, with the result that many veterans had smoking-related diseases, including lung cancer. However, the health care system for veterans, and their families, in Taiwan was especially well-designed and accounted for a major part of the budget for veterans affairs in Taiwan, with the result that veterans did not have to pay health insurance, and they can visit hospitals and outpatient clinics free of charge. Thus, the socioeconomic status of veterans in Taiwan did not have an effect on their seeking medical care.

A population-based study of lung cancer in Pennsylvania, comparing veteran and civilian populations, was published recently.[1] The median survival was 6.3 months for veteran patients and 7.9 months for patients in the rest of the state, and the 5-year overall survival rate was 12% for veteran patients and 15% for patients in the rest of the state. The authors concluded that the overall survival of veterans with lung cancer in Pennsylvania was inferior to that of patients in the remainder of the state. They suggested further investigations to determine whether this disparity was caused by differences in socioeconomic status or comorbidities, or whether there were systematic differences in the diagnosis, staging, or treatment of lung cancer between veteran and civilian patients. The present study was undertaken to determine whether or not there exists a difference in the clinical characteristics, marital status, staging, treatment, and survival between Chinese veterans and civilians with lung cancer, especially non-small-cell lung cancer (NSCLC).

Methods

We retrospectively reviewed the medical records and computer files of our lung cancer patients diagnosed between 1996 and 2000. Only those patients who had a histocytologic diagnosis of lung cancer were included in the present study. Clinical staging was performed with chest computed tomography (CT) scan (including liver and adrenal glands), brain CT scan, and whole-body bone scan examinations. Staging was done according to the TNM staging criteria revised in 1997.[3] Marital status (single, married, widowed/divorced) was recorded based on the patients' reports.

For the analysis, survival was measured from the diagnosis of lung cancer until the date of death or last follow-up. The Kaplan-Meier method with a log-rank test was used for univariate survival analysis ($\alpha = 0.05$). The Cox regression test, including veteran or civilian, age (≤ 65 or > 65 years) and sex, was used for multivariate survival analysis of all lung cancer and NSCLC patients. Two-sided Pearson's χ^2 test was used for comparison between clinical characteristics or treatment modality. The SPSS (Statistical Package for the Social Sciences) statistical program was used.

Results

During this period, 3,727 patients with lung cancers were diagnosed, including 3,312 patients with NSCLC (88.9%) and 415 with SCLC (11.1%). Of the 3,312 NSCLC patients, 801 (24.2%) were female, and of the 415 SCLC patients, 38 (9.2%) were female ($p < 0.001$). Among the patients with NSCLC, adenocarcinoma accounted for 1,743 (52.6%) cases, and squamous cell carcinoma for 988 (29.8%) cases; the remaining 581 (17.5%) cases were type unspecified NSCLC. In the staging of NSCLC, 500 (15.1%) patients were stage I, 162 (4.9%) patients were stage II, 914 (27.6%) patients were stage III, 1,426 (43.1%) patients were stage IV, and the remaining 310 (9.4%) patients had incomplete staging.

Among the 3,727 lung cancer patients, 2,386 were civilians and the remaining 1,341 were veterans. Kaplan-Meier survival analysis of all lung cancers showed that civilians had better survival than veterans (median, 12 months *vs.* 8 months, $p < 0.001$) (Figure 1). The 1-year, 3-year and 5-year survival rates were 48.5%, 19.2% and 12.4% in civilians, and 36.1%, 13.8% and 8.9% in veterans, respectively. Median survival of veterans with NSCLC was 9 months, while it was 13 months in civilians ($p < 0.001$; Figure 2). The 1-year, 3-year and 5-year survival rates were 50%, 20.5% and 13.4% in civilians, and 38.7%, 15.1% and 9.6% in veterans, respectively. Median survival of civilians with SCLC ($n = 229$; median, 13 months) was longer than that for veterans with SCLC ($n = 186$; median, 9 months), but without statistical significance ($p = 0.078$).

Among 1,155 veterans with NSCLC, only 1,027 (88.9%) patients had complete staging. Similarly, 1,975 of 2,157 (91.6%) civilians had complete staging. When survival analysis was performed according to staging status, median survival time was better for civilians than veterans in stage I NSCLC patients (62 months *vs.* 52 months, $p = 0.093$). The 5-year survival rate for stage I NSCLC was 50.7% in civilians and 43% in veterans. The 5-year survival rates for stage II, III and IV NSCLC were 26.8%, 10.4% and 2.3% in civilians and 17.2%, 5.4% and 0.9% in veterans, respectively. Median

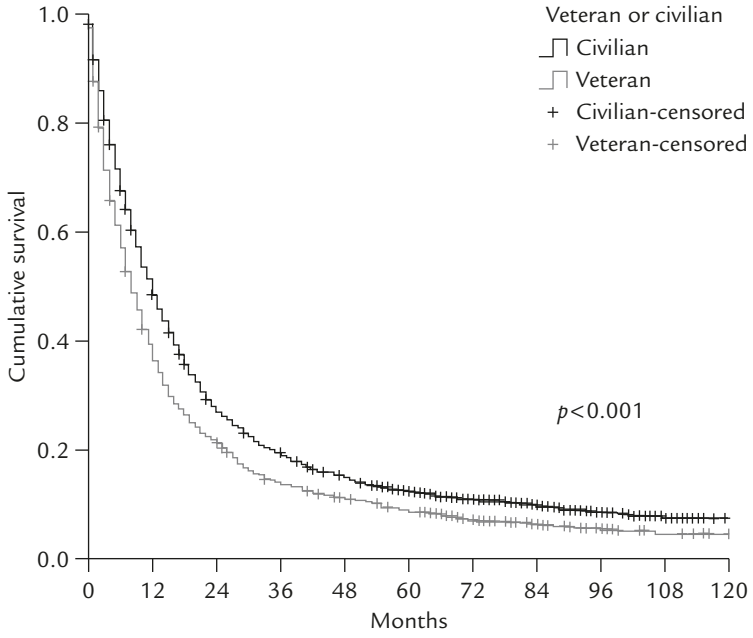

Figure 1. Overall survival curve of 3,727 lung cancer patients diagnosed between 1996 and 2000. The median survival time was 12 months in civilians and 8 months in veterans ($p < 0.001$). The 1-year, 3-year and 5-year survival rates were 48.5%, 19.2% and 12.4% in civilians, and 36.1%, 13.8% and 8.9% in veterans, respectively.

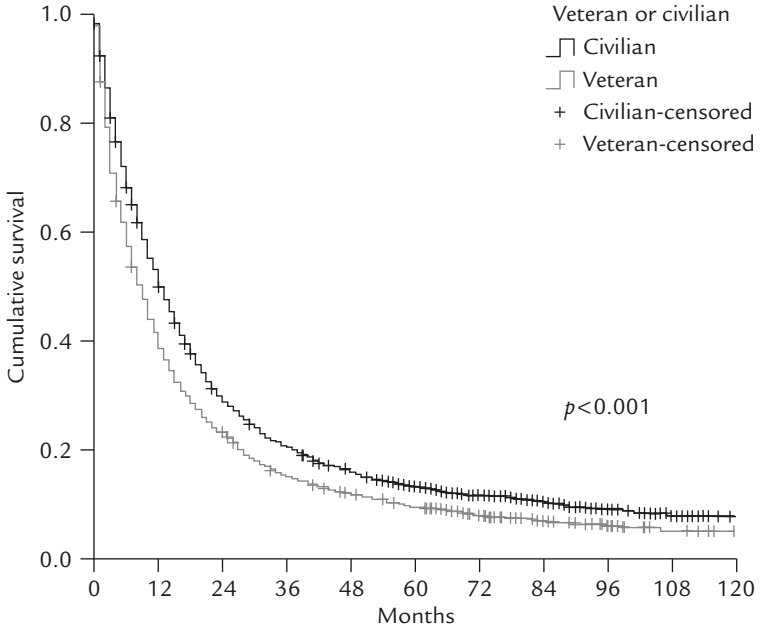

Figure 2. Overall survival curve of 3,312 non-small-cell lung cancer patients diagnosed between 1996 and 2000. The median survival time was 13 months in civilians and 9 months in veterans ($p < 0.001$). The 1-year, 3-year and 5-year survival rates were 50%, 20.5% and 13.4% in civilians, and 38.7%, 15.1% and 9.6% in veterans, respectively.

survival was significantly better for civilian patients than veterans, regardless of stage II, III or IV (Table 1).

When marital status was considered, civilian lung cancer patients who were single ($n = 139$; median, 8 months) had better survival than veterans who were single ($n = 290$; median, 5 months) ($p = 0.01$; Figure 3). This survival difference was also significant between civilians who were married ($n = 2{,}048$; median, 12 months) and veterans who were married ($n = 947$; median, 9 months) ($p < 0.001$; Figure 4). However,

Table 1. Survival status of non-small-cell lung cancer patients according to staging

	Survival					*p*
	Median (mo)	1-year (%)	2-year (%)	3-year (%)	5-year (%)	
Stage I						0.093
C ($n=335$)	62	89.3	75.5	64.5	50.7	
V ($n=165$)	52	81.8	70.9	58.6	43.0	
Stage II						0.029
C ($n=98$)	21	60.6	43.8	36.5	26.8	
V ($n=64$)	11	46.9	32.8	23.4	17.2	
Stage III						<0.001
C ($n=582$)	13	54.7	26.4	18.3	10.4	
V ($n=332$)	10	38.0	20.5	9.9	5.4	
Stage IV						<0.001
C ($n=960$)	8	32.8	12.9	6.0	2.3	
V ($n=466$)	5	22.8	7.5	3.2	0.9	

C = civilians; V = veterans.

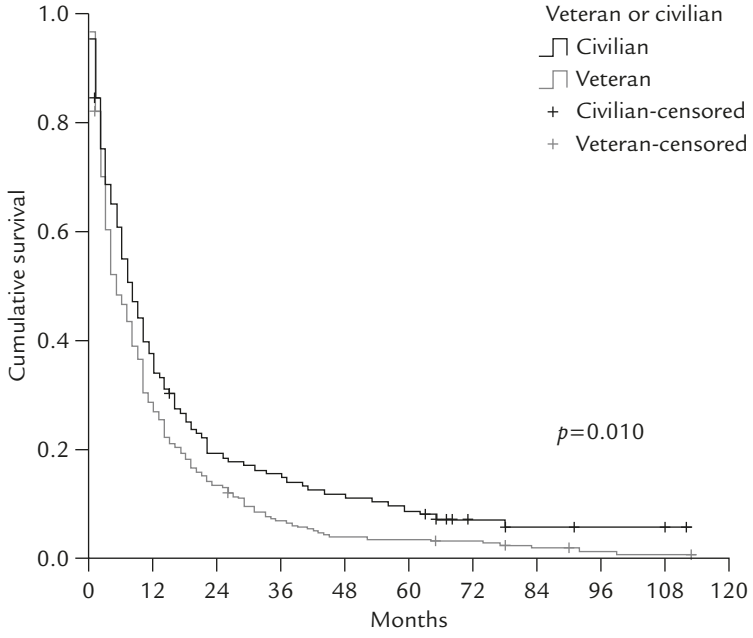

Figure 3. Overall survival curve of 429 lung cancer patients who were single. The median survival time was 8 months in civilians ($n=139$) and 5 months in veterans ($n=290$) ($p=0.01$). The 1-year, 3-year and 5-year survival rates were 34.1%, 14.9% and 8.9% in civilians, and 27%, 7% and 3.7% in veterans, respectively.

there was no survival difference between civilians ($n=150$; median, 8 months) and veterans ($n=62$; median, 5 months) who were widowed or divorced ($p=0.144$).

Among 1,155 veterans with NSCLC, the marital status of 1,121 veterans was known, including 247 single, 816 married, and 58 widowed or divorced. The veterans who were married had better survival than those who were single, widowed or divorced, with a median survival difference of at least 5 months ($p<0.001$; Figure 5). The 1-year, 3-year and 5-year survival rates for veterans who were married were 42.6%, 17.3% and 11.5%, for those who were single were 29.7%, 7.4% and 3.5%, and for those who were widowed or divorced were 24.1%, 15.5% and 9.9%, respectively. Marital status also had a similar impact on the survival status of veterans with stage IV NSCLC ($p<0.001$; Figure 6). Median survival was 10 months, 5 months and 4 months, and 1-year survival rates were 27.2%, 14.3% and 3.8% for veterans with stage IV NSCLC who were married ($n=320$), single ($n=106$) and widowed or divorced ($n=26$), respectively. Those patients who had stage IV NSCLC and who were married received

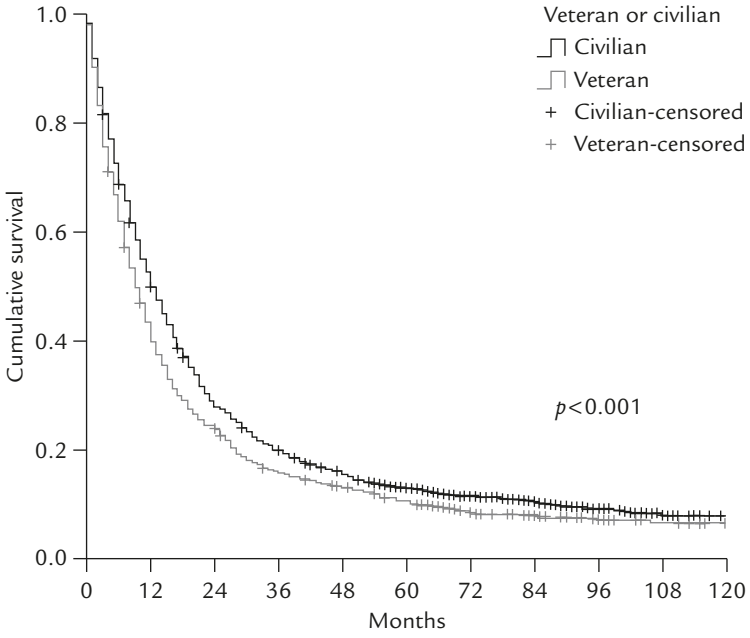

Figure 4. Overall survival curve of 2,995 lung cancer patients who were married. The median survival time was 12 months in civilians ($n=2,048$) and 9 months in veterans ($n=947$) ($p<0.001$). The 1-year, 3-year and 5-year survival rates were 49.9%, 19.8% and 13% in civilians, and 39.8%, 15.7% and 10.4% in veterans, respectively.

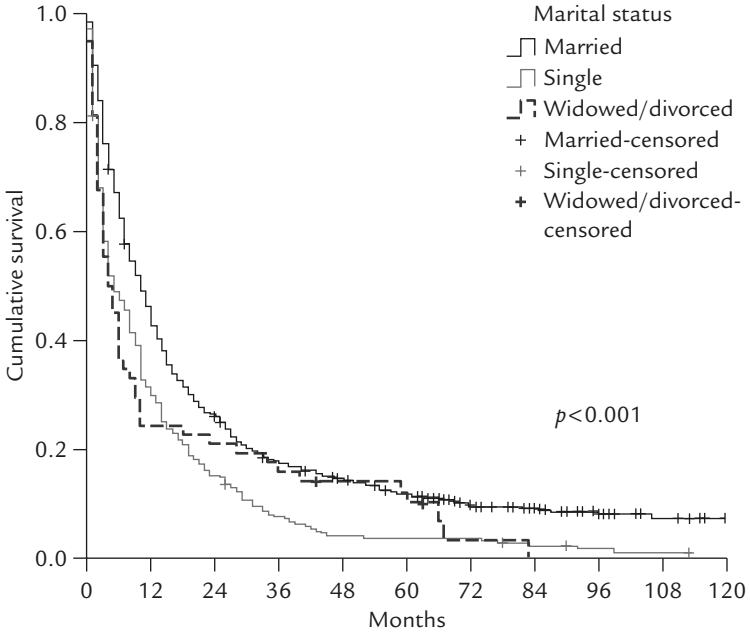

Figure 5. Overall survival curve of 1,121 veterans with non-small-cell lung cancer whose marital status was known. The median survival was 10 months, 5 months and 4 months for those who were married, single and widowed or divorced, respectively ($p<0.001$). The 1-year, 3-year and 5-year survival rates for veterans who were married were 42.6%, 17.3% and 11.5%. The corresponding rates were 29.7%, 7.4% and 3.5% for those who were single, and 24.1%, 15.5% and 9.9% for those who were widowed or divorced.

chemotherapy more frequently (48.4%), followed by those who were single (31.1%), and those who were widowed or divorced (23.1%) ($p=0.001$). However, no significant difference in survival was found between these 3 groups of patients (median survival, 3 months, 3 months, and 2 months, respectively, for married, single, and widowed or divorced; $p=0.374$). The 1-year survival rates were 36.1%, 34.5%, and 16.7%, respectively, for married, single, and widowed or divorced patients. In contrast, 165 married, 73 single,

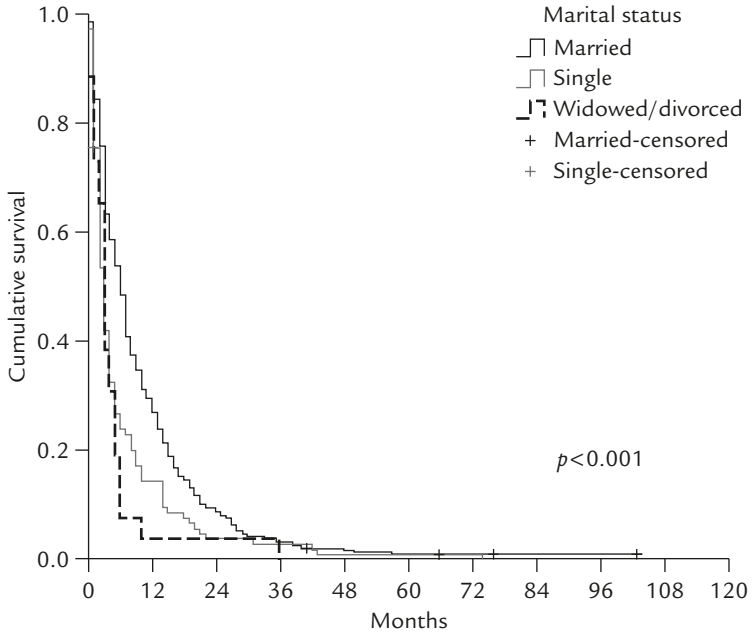

Figure 6. Overall survival curve of 452 veterans with stage IV non-small-cell lung cancer (NSCLC) whose marital status was known. The median survival was 10 months, 5 months and 4 months, and 1-year survival was 27.2%, 14.3% and 3.8% for veterans with stage IV NSCLC who were married, single and widowed or divorced, respectively ($p < 0.001$).

and 20 widowed or divorced veterans received the best supportive care only. There was a significant difference in survival in these patients who received supportive care only, and the best survival was found in those who were married (median survival, 3 months, 2 months, and 3 months, respectively, for married, single, and widowed or divorced; $p = 0.002$). The 1-year survival rates were 18.8%, 5.5%, and 0%, respectively, for married, single, and widowed or divorced.

In married veterans, surgery was the primary treatment modality in 211 of 816 patients (25.9%); 40 of 193 single (20.7%), and 14 of 68 (20.6%) widowed or divorced veterans also received surgery ($p = 0.241$). Chemotherapy was the primary treatment modality in 303 of 816 married veterans (37.1%); 78 of 193 single (40.4%), and 13 of 68 (19.1%) widowed or divorced veterans also received chemotherapy ($p = 0.006$). In contrast, veterans who were single (35.8%) and those who were widowed or divorced (29.4%) received supportive care only more frequently than married veterans (21.7%) ($p < 0.001$).

A comparison of treatment modality between veterans and civilians based on staging showed that surgery was the main treatment modality in both stage I and II civilians and veterans. However, a greater proportion of veterans in stage II and III than civilians at the same stage underwent radiotherapy, and there was a statistically significant difference in stage III patients ($p < 0.001$). There was no statistical difference in the treatment modality of stage IV civilians and veterans (Table 2).

When considering male patients alone, male civilian lung cancer patients ($n = 1{,}557$; median, 11 months) had better survival than male veteran patients ($n = 1{,}331$; median, 8 months) ($p < 0.001$). Among male patients with NSCLC, civilians ($n = 1{,}364$; median, 11 months) had better survival than veterans ($n = 1{,}147$; median, 9 months) ($p < 0.001$). Among male patients with stage IV NSCLC, civilians ($n = 565$; median, 6 months) had better survival than veterans ($n = 462$; median, 5 months) ($p = 0.004$). Importantly, there was no survival difference between male civilians ($n = 256$; median, 8 months) and veterans ($n = 199$; median, 8 months) with stage IV NSCLC who received chemotherapy ($p = 0.255$).

Age is another important factor. Since the majority of veterans who retreated from China were older than 65 years in 1996, we classified lung cancer patients into those 65 years old or younger and those older than 65 years. We found that survival was poorer for elderly veterans ($n = 1{,}261$) with lung cancer than for elderly civilians ($n = 1{,}306$) (median, 8 months *vs.* 10 months, $p = 0.009$), and for elderly veterans ($n = 1{,}090$) with NSCLC compared to elderly civilians ($n = 1{,}153$) (median, 8 months *vs.* 10 months, $p = 0.019$). In contrast, no survival difference was found between civilians and veterans with lung cancer, or NSCLC patients aged 65 years or younger (data not shown).

Table 2. Primary treatment modality of 3,002 non-small-cell lung cancer patients who had complete staging information*

Stage	Surgery	Radiotherapy	Chemotherapy	Supportive care	$p^{\dagger}$
I					0.543
Civilian	279 (83.3)	22 (6.6)	9 (2.7)	25 (7.5)	
Veteran	137 (83)	15 (9.1)	5 (3)	8 (4.8)	
II					0.279
Civilian	63 (64.3)	10 (10.2)	6 (6.1)	19 (19.4)	
Veteran	36 (56.3)	9 (14.1)	9 (14.1)	10 (15.6)	
III					<0.001
Civilian	154 (26.5)	80 (13.7)	244 (41.9)	104 (17.9)	
Veteran	54 (16.3)	72 (21.7)	151 (45.5)	55 (16.6)	
IV					0.051
Civilian	84 (8.8)	174 (18.1)	452 (47.1)	250 (26)	
Veteran	29 (6.2)	88 (18.9)	200 (42.9)	149 (32)	

**Data presented as n (%); †Pearson's 2-sided χ^2 test comparing treatment modality between civilians and veterans.*

Table 3. Multivariate survival analysis of patients with lung cancer or non-small-cell lung cancer (NSCLC)

	HR	95% CI	*p*
Lung cancer			
Veteran *vs.* civilian	1.058	0.976–1.146	0.173
Male *vs.* female	1.194	1.092–1.307	<0.001
Age ≤ 65 yr *vs.* > 65 yr	0.762	0.703–0.827	<0.001
NSCLC			
Veteran *vs.* civilian	1.061	0.972–1.157	0.183
Male *vs.* female	1.145	1.043–1.257	0.005
Age ≤ 65 yr *vs.* > 65 yr	0.765	0.072–0.834	<0.001

HR = hazard ratio; CI = confidence interval.

Multivariate Cox-regression survival analysis, including civilian or veteran, sex and age (≤ 65 years or > 65 years), showed that only sex and age were independent risk factors for mortality, with hazard ratios of 1.194 and 0.762, respectively. Sex and age were also independent risk factors for mortality, with hazard ratios of 1.145 and 0.765, respectively, for NSCLC (Table 3).

Discussion

It has been reported that patients who have racial differences and discordant interactions with their doctors do less to prompt doctors for information, and doctors in turn provide less information to these patients.[4] It was also noted that black patients may have lower trust in their physicians, in part because of poorer physician-patient communication, when compared with white patients.[5] Whether or not such a difference exists in Taiwan, where veterans and civilians are all of Chinese ethnicity, is unknown. However, veterans, especially those who retreated from China, are a specific subpopulation in Taiwan with a relatively lower educational level, and many of these patients who retired as rank-and-file soldier or non-commissioned officer are in lower socioeconomic levels. In contrast, the second generation of veterans who retired as officers in Taiwan is generally well-educated and in higher socioeconomic levels. The communication between the former group of patients (retired as rank-and-file soldier or non-commissioned officer) and their families is less informative or less compliant than that between the latter group (retired as officers) and their families.

Surgical treatment was given to the majority of patients (83%), both civilian and veteran, with stage I NSCLC. Veterans received less surgical treatment in stage II (56% *vs.* 64%) and stage III (16% *vs.* 26%) NSCLC, compared to civilians in the same stage, with radiotherapy more common for those veterans who did not receive surgical intervention, suggesting that a more conservative treatment was given to some of these populations ($p < 0.001$ in stage III patients; Table 2). The most likely reason is that the majority of veteran patients were older than the civilian patients, and that chronic obstructive pulmonary disease with poor pulmonary and even cardiovascular function was more common in veterans.[6] The reason for this is that each soldier in Taiwan received at least 20 packs of cigarettes free of charge or at a discounted price every month from the government for decades after the KMT retreated from China to Taiwan, thus leading many soldiers, and later veterans, to develop and sustain the

habit of smoking. This free-of-charge cigarette policy in the army was stopped more than 10 years ago. Another possibility is that civilians tend to receive treatment more aggressively than veterans, since more civilians underwent chemotherapy and more veterans received supportive care alone in stage IV NSCLC, with borderline statistical significance ($p=0.051$; Table 2).

The majority of veterans who retreated from China were older than 65 years in 1996. We found that elderly veterans with lung cancer or NSCLC had poorer survival than elderly civilians. The prevalence of comorbidities such as chronic obstructive pulmonary disease and cardiovascular disease that was related to smoking was higher in elderly veterans than in civilians, due to the higher prevalence rate of smoking in veteran populations. However, there was no survival difference between the younger civilians and veterans who suffered from lung cancer or NSCLC, and the majority of these younger veterans joined the military after the KMT had retreated to Taiwan. More importantly, there was no survival difference in male patients with stage IV NSCLC who received chemotherapy among civilians and veterans ($p=0.255$), with the same median survival of 8 months and 1-year survival rates of 38.6% in civilians and 34.4% in veterans. This meant that there was a similar chemotherapy treatment effect on cancer patients regardless of whether they were a civilian or veteran once the patient had been judged to be appropriate for chemotherapy;[7–10] the support system and medical care for veterans is rather robust in Taiwan. In addition, multivariate survival analysis showed that veteran standing was not a significant prognostic factor when age and sex were considered together, suggesting that both civilians and veterans had similar survival when the factors of age and sex were excluded.

Veterans with stage IV NSCLC who were married received chemotherapy more frequently than those who were single, widowed or divorced. The 1-year survival rate was significantly better for veterans with stage IV NSCLC who received chemotherapy than for those who did not receive chemotherapy, regardless of marital status. Survival status was better for married veterans, even when they received supportive care only, when compared with single, widowed or divorced veterans. Thus, marital status and family are other important sources of support, especially psychological support, for veteran patients with lung cancer.

In conclusion, this is the largest study so far discussing veteran patients with lung cancer who mainly came from China and stayed in Taiwan. The poor survival of these veterans is due to age and sex rather than to their standing as veterans.

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