Variation in lung cancer survival rates between countries: Do differences in data reporting contribute?

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Summary

\textbf{Background:} Mortality rates from lung cancer are known to vary considerably between countries. Differences in patients, disease, investigation and treatment are thought to account for some survival shortfalls but it is not known whether differences in collection or processing of data also contribute.

\textbf{Methodology:} We searched recognised sources where information regarding mortality rates have been published for the United Kingdom, Europe and United States (US). Data regarding patient selection, demographics and mortality rates were extracted.

\textbf{Results:} Published international 5-year survival for patients with lung cancer varies from 5\% to 16\%. The survival figures quoted in the literature are based on data which varies widely in its collection and statistical analysis and this information is not always in the public domain. Data from the US suggests an overall 5-year survival rate of up to 16\% although this figure covers only a quarter of the general population and excludes patients without histological confirmation. Many European countries report higher mortality rates although in most, data includes patients without proven histology. European datasets have variable population coverage.

\textbf{Conclusion:} Selective data collection and variable population coverage may account for some of the differences in lung cancer survival between countries. More transparent description of data collection and analysis would be helpful but
Introduction

Lung cancer is the leading cause of cancer death in European men. In the United Kingdom (UK), it has now superseded breast cancer as the leading cause of cancer death in women.1,2 Despite advances in many areas of oncology, lung cancer survival figures remain disappointingly poor1,3 and it is well documented that survival rates in the United States (US) and some European countries are significantly greater than those achieved in the UK and Scandanavia.1,4 As a result, there has been considerable debate as to the cause of the observed survival inequalities.5–7 For example, differences in eligibility for curative intervention, and accessibility of investigations and treatment have all been considered as potential explanations. As a consequence, government bodies in the UK and Denmark have endeavoured to address the issues raised.8–11

To date, there has been little discussion of the differences in data collection in the overall interpretation of lung cancer survival figures. Indeed, it stands to reason that the proportion of the national population covered in a database, the inclusion of patients with unproven histology and the statistical correction to produce relative survival could significantly alter results. The purpose of this study is to determine whether factors such as these might contribute to international variations in documented survival.

Methodology

The most up to date published survival data from the UK, Europe and the US were firstly identified. Following this, all authors independently searched for information regarding 5-year survival rates, collection period, the proportion of patients having histological confirmation and population demographics.

Results

United States

In the US, the National Cancer Institute (NCI) was found to be the primary source of survival figures for all cancers and publishes 5-year survival collected from the surveillance, epidemiology, and end results (SEER) program. It currently collects cancer incidence and survival data from 14 population-based cancer registries and three supplementary registries.4 SEER calculates relative survival using survival figures from the US general population of the same age sex and race. The statistical basis of the SEER survival calculations for lung cancer is not in the public domain.

The overall 5-year survival for the whole SEER population was 15.2%.4 Only patients with a histological diagnosis of small cell (11,306) or non-small cell (64,035) lung cancer were included. These data incorporate only 26% of the US population and the inference is that this subgroup is a only a reflection of total US population in terms of wealth and education.4

England and Wales

For England and Wales, Cancer Research UK 2000 provided the source of information. A 5-year age standardised survival of 6% for lung cancer was reported between 1996 and 19992 All patients —irrespective of having a histological diagnosis— were included, with nearly 100% of the national population represented in the database.

Scotland

For Scotland, data were obtained from Scottish health statistics website (www.isdscotland.org). The 5-year age-standardised relative survival rates were similar to the survival rates for England and Wales (Table 1).2,12 All histological types of lung cancer—including those without proven histology—were included and the database included virtually 100% of the population.

Northern Ireland

For Northern Ireland, the cancer registry data provided detailed mortality data.13 The Northern Ireland Cancer Registry published a comprehensive report encompassing incidence and mortality statistics for all cancers in their population (Table 1).13 The 5-year relative survival for patients with lung
cancer diagnosed between 1996 and 1999 was higher than England and Wales (Table 1). The breakdown of histological subtype in this population was 58% for non-small cell and 14% for small cell. Twenty-seven percent of the population group did not have a histological diagnosis. As expected, 5-year survival varied between patients with non-small cell lung cancer, small cell lung cancer and those with unknown histology; respective values were 13.1%, 3.2% and 4%.

Europe

For other European countries, EUROCARE provided relevant data. The collection and statistical analysis of these data are well described and in the public domain. The EUROCARE 3 study was carried out between 1990 and 1994, with a minimum follow-up to 1998 to measure survival from cancer across a large number of European countries. The EUROCARE 3 report did acknowledge that there were differences in the quality of data provided by the European cancer registries in terms of disease definition, case collection, and follow-up. Inadequate follow-up of vital status may contribute to apparent survival advantages in Austria and Spain where deaths may be missed. The most favourable 5-year survival for males and females was observed in Austria, Spain and France (Table 1) with an overall European survival rate of 9.7% and 9.6% for males and females, respectively. Survival was poor in some Eastern European countries but also in Denmark and in the UK. No comparisons between race or histological subtypes were made in this study. However, all cases including those without proven histology were included. Information on microscopic verification was provided, with most registries verifying over 70% of their lung cancer cases. There was wide variation in the proportion of the national population included in the data. In general, those datasets reporting the best survival included lower proportion of the national population.

Discussion

The international variation in published survival figures for lung cancer is a concern for patients and professionals alike. We have highlighted that published 5-year survival rates are markedly higher in the US than in the UK and some European countries. The literature suggests that this may be due to real differences in patients, disease, investigation and treatment, although it seems likely that differences in the collection and presentation of data may also contribute. For frequently quoted figures such as those coming from SEER, which is the principal source of survival figures for the US, not all the methodology of data collection and statistical analysis is in the public domain. Where it is available, figures are often quoted without reference to the differences in data collection and processing.

In the UK over the last decade, health care professionals have worked with government bodies to identify and address survival shortfalls. It has been suggested that the UK is unable to offer the same level of care for cancer as other European countries because of sub-optimal numbers of radiotherapists and medical oncologists. Indeed, in one study, the mean total delay from presentation to

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leads survival statistics. In another study, a single-centre prospective audit on lung cancer waiting times demonstrated that 21% of potentially curable patients became incurable while waiting for appropriate treatment, while tumour control in small cell lung cancer may be also adversely affected by prolonged waiting times. No direct international comparisons of investigation and treatment delays have been made and the contribution made to survival shortfalls are therefore difficult to quantify.

The use of radical treatment varies both nationally and internationally, and surgical resection rates in the UK have come under recent scrutiny. The most optimistic figures suggest that less than 20% of patients presenting with lung cancer have curable disease. The published rate for surgical intervention for lung cancer in the UK is between 10–11%, although department of health guidelines suggest that 20% of individuals with non-small cell lung cancer should be suitable for surgery. Some evidence suggests that in some parts of Europe and the US the surgical resection rate is almost 30%. There are few data describing the number of patients receiving radical radiotherapy or whether radiotherapy delivered is the more effective continuous hyperfractionated accelerated radiotherapy (CHART) or more conventional radical radiotherapy. There is a single-centre prospective audit on lung cancer waiting times demonstrating that 21% of potentially curable patients became incurable while waiting for appropriate treatment, while tumour control in small cell lung cancer may be also adversely affected by prolonged waiting times. No direct international comparisons of investigation and treatment delays have been made and the contribution made to survival shortfalls are therefore difficult to quantify.

Elsewhere in the European Union, the EUROCARE 3 study reported that for lung cancer (and many other common cancers), even the most favourable survival rates failed to reach the corresponding least favourable rates quoted in the SEER database. The EUROCARE study also noted that most European countries provided nationwide access to healthcare, whereas a significant proportion of US citizens have no or sub-optimal health insurance. Since the group without health insurance is likely to be over-represented among lung cancer patients, it is therefore difficult to understand why the US leads survival statistics.

Is it possible that apparent survival differences may result from differences in data or its presentation? EUROCARE 3 remarks that differences in registry coverage and death certificate only registration may alter survival. It is clear that comparisons made between countries need to include a description of data and its analysis. The proportion of the population included in a cancer registry differs widely between countries as does the method of data collection. The statistical methods used for standardisation for age and race also differ between international data sets. The SEER database includes 26% of the US population, whereas the countries included in the EUROCARE 3 database vary between 2.8% and 100% (Table 1). In Spain, which has one of the most favourable EU 5-year survival outcomes, the population coverage is only 14.5%. Follow up of patients in Spain is also known to be less complete. In the EUROCARE study relative survival is calculated by the Hakulinen method.

The omission of patients without histology in the SEER database is likely to lead to more favourable US survival statistics. Twenty-seven percent of the Northern Ireland population with lung cancer did not have a histological diagnosis and the 5-year survival in this group was 4%, compared to 13.1% for the non-small cell subgroup. Other UK cancer registries do include all cases diagnosed as lung cancer with or without histology. The impact of excluding patients without histology from the data will depend on the rate of histological confirmation within the population. EUROCARE 2 illustrates the varying rates of histological confirmation within Europe and goes on to demonstrate survival differences between patients with the same confirmed histology suggesting that within Europe the interaction between histology and survival is complex.

In conclusion, large variations in published survival figures between countries for lung cancer are well documented and require further explanation. Many of these variations may relate to differences in patients, disease stage at presentation, in diagnosis or in treatment. As our study suggests, some important differences are also likely to relate to collection and presentation of data. A greater emphasis on the use of comparable data may help clarify and address real survival shortfalls. In the future, before valid direct comparisons can be made between different countries and continents in terms of lung cancer survival rates, it is imperative that similar methods of data collection and presentation are employed along with ensuring similar—and indeed comparable—populations are evaluated. National and international bodies involved in the processing of mortality rates for any type of cancer should ideally attempt to employ similar strategies, with the ultimate aim of identifying and addressing shortfalls in optimum patient care. Moreover, perhaps there is a role for an international body to develop a way of standardising the description of international datasets in turn making any differences in published cancer survival rates easier to interpret, more transparent.
and more easily accessible to both the public and clinicians.

References