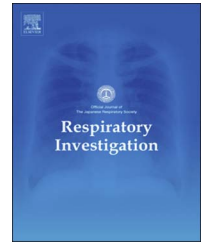




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## Original article

# Who treats lung cancer? Results from a global survey<sup>☆, ☆ ☆</sup>

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## ABSTRACT

**Background:** In most Western nations, the medical oncologist plays a significant role in the administration of systemic therapy for lung cancer. In Japan however, treatment for lung cancer has historically been provided by pulmonologists and thoracic surgeons. A comparison of the management of advanced disease between Japan and other nations has not been described.

**Methods:** An online, self-administered, international survey was sent to 3907 active members of the American Society of Clinical Oncology. Eligible participants were degreed physicians who prescribed systemic agents for adult cancer treatment within the past five years.

**Results:** In total, 281 respondents answered the questions regarding management of lung cancer. Thorough analysis demonstrated that pulmonologists play a significant role in Japan and the Netherlands, where the role of oncologic specialists is not well established. Of note, all the respondents from the Netherlands reported that pulmonary medicine primarily manages systemic chemotherapy in stage IV, adjuvant chemotherapy, and targeted therapy. **Conclusion:** We found there are several nations where non-oncologic specialists play a critical role in the systemic treatment of lung cancer. We expect this practice pattern to continue until the global adoption of the oncologic specialty role.

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## 1. Introduction

Cancer mortality is a major healthcare problem worldwide. According to the World Health Organization, approximately

8.2 million people globally die from cancer every year [1]. Among over 100 types of human malignancies, lung cancer accounts for one of the most common cancer mortalities in Western nations as well as in Japan [2]. Health care

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professionals, researchers and international societies have invested enormously to decrease the morbidity and mortality burden of this disease. Significant improvements in outcomes have been seen in the prevention, detection, and treatment with the use of computer tomography for screening, new surgical and radiation techniques, discovery of driver oncogenes and immune checkpoints, and the development of targeted/immunotherapy [3–6]. Despite all of these achievements, a vast majority of lung cancer patients succumb to the disease within a few years of diagnosis [7].

In the 1960s and 1970s, medical organizations and disease specific organizations were founded in the United States (US) and other Western nations to address the growing demand of cancer care. In the US, the American Society of Clinical Oncology (ASCO) was founded in 1964, with board-certification in medical oncology being established in 1973 [8]. As of July 2015, there are over 13 thousand certified oncologists in the US [9]. In contrast, the Japan Society of Medical Oncology was founded in 2002, started a certifying process in 2006, and has certified approximately 1000 oncologists since 2015 [8,10]. Given the recent timing of the recognition of medical oncology as a specialty in Japan, other specialties covering thoracic disease such as pulmonary medicine and thoracic surgery have served as de facto oncologists in Japan over many decades [8].

The purpose of the original survey was to identify global differences in roles of oncologic and non-oncologic specialists in cancer care [11]. Specifically, we were interested in how the management disease differed globally. In this focused analysis, we found a unique international practice pattern in the treatment of lung cancer that has not been previously reported in the literature.

## 2. Materials and methods

We have conducted a self-administered, international online survey to understand role of oncologic specialties in cancer care. The study sampling frame included 3907 active ASCO members in nations where there were at least 30 members listed in the online directory. Screening questions were developed in order to exclude those who did not have medical degree, had not completed postgraduate clinical training, and who had not prescribed systemic cancer therapy for adult patients in the last 5 years. This process was intended to enrich the population with experience and interest in systemic cancer therapy, and to avoid coercive pressure on those who were still in training. Participants were asked which specialty physicians in their institution are primarily responsible for managing systemic treatment in each of nine organ systems: CNS, head/neck, lung, breast, gastrointestinal, genitourinary, gynecological, soft tissue, skin regions. Additional details of the survey design is described in detail elsewhere [11]. Respondents were contacted via email, which contained a link for accessing the survey through the program SurveyMonkey®. This study was reviewed and approved by University of Kansas Medical Center institutional review board.

In this analysis, we focused on the practice patterns in the treatment of lung cancer. Demographics of respondents

treating lung cancer were assessed for degree, age, sex, years of practice, practice setting (academic vs. government vs. community), region, and specialty. Frequencies of oncologic specialties responsible for the following clinical setting were determined by geographic region and nation: systemic chemotherapy in stage IV disease, adjuvant chemotherapy, and targeted therapy (e.g., erlotinib for EGFR mutated metastatic NSCLC). Oncologic specialties were defined as either of medical oncology, hematology-oncology, or clinical oncology (specialty managing both systemic and radiation therapy).

### 2.1. Statistical analysis

We estimated a response rate of 10%, which is the expected response rate using this type of web-based technology [12,13]. Data were analyzed by region and/or nation. Chi-square tests were used to assess the differences in practice of oncology verses non-oncology specialties among the regions. A  $p$ -value  $\leq 0.05$  was considered statistically significant.

## 3. Results

The demographics of the 281 respondents (7.20%) who provided information about the primary specialty responsible for delivering systemic chemotherapy in stage IV lung cancer are shown in Table 1. All respondents have a medical degree and most have an additional degree (55.4%). The majority of respondents are male (66.9%), are at least 35 years old (96.0%) and have more than 10 years of practice experience (69.0%). More than 60% are medical oncologists, whereas a quarter of respondents are either hematologist-oncologists, clinical oncologists, or radiation oncologists; the latter two are common specialists in northern Europe to manage both systemic and radiation therapy. In total, more than 80% of respondents are oncologic specialists who specialize in the treatment of lung cancer.

Oncologic specialists are primarily responsible for systemic chemotherapy in stage IV lung cancer in most nations. However, systemic chemotherapy in stage IV lung cancer is managed more commonly by non-oncology specialists in the European Union (EU) as compared with other geographic regions (Fig. 1A: Chi-square test,  $p = 0.014$ ). Twenty of 90 respondents (28.6%) from the EU reported that chemotherapy in stage IV lung cancer is primarily prescribed by non-oncologic physicians such as pulmonologists as compared with one of 47 (2.1%) in the Americas. A similar trend was seen in adjuvant chemotherapy (Fig. 1B: 22.2% in EU vs. 8.7% in Americas,  $p = 0.250$ ) as well as in targeted therapy (Fig. 1C: 19.5% in EU vs. 0% in Americas,  $p = 0.004$ ). Among non-oncologic specialties, pulmonary medicine played a critical role, accounting for 13.2%, 10.8%, and 10.8% in the management of chemotherapy in stage IV, adjuvant chemotherapy, and targeted therapy, respectively (data not shown).

The roles of each non-oncologic specialist were thoroughly investigated by nation (Table 2). Upon review, with the exception of the Netherlands, Nigeria, Japan, and China, most (60%) respondents reported that oncologic specialists are primarily responsible for the treatment of stage IV lung cancer. In these nations, pulmonary medicine accounts for

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