Lung Cancer Survival Gains: Contributions of Academia and Industry

Health Policy Portal

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Non-small cell lung cancer (NSCLC) is the leading cause of cancer death worldwide.[1] Although overall survival rates among patients with the disease remain low,[2] modest improvements have been reported in recent decades.[3] These improvements have been achieved in large part due to practice-changing randomized controlled trials (RCTs), some related to drug products and others to interventions such as surgery and radiotherapy. Understanding which interventions have yielded overall survival gains and which institutions have contributed to the RCTs revealing these benefits can help identify the greatest drivers of public health benefit and inform the allocation of scarce health care resources. Accordingly, we reviewed the sponsorship and funding of RCTs demonstrating life-extending outcomes in non-small cell lung cancer.

We used the National Comprehensive Cancer Network (NCCN) guidelines for NSCLC (v.5.2017) to identify the cohort of interventions for this study. We chose the NCCN guidelines because they are the most widely used multi-disciplinary guidelines in cancer and include drug and non-drug interventions. For each intervention, we assessed its supporting evidence, selecting only interventions that were tested in at least one RCT. We collected the report of the RCT from PubMed and evaluated whether it found overall survival gains related to the intervention. Interventions for which RCTs did find overall survival gains were categorized as taking place in the curative (non-metastatic) or non-curative (advanced or metastatic) setting. For each RCT, we recorded the overall survival gains (5-year overall survival rates were available in the curative setting, and median overall survival was available in the non-curative setting; hazard ratios were obtained for each setting), the sponsor (defined as the person or entity that takes responsibility for a clinical investigation), and the funder (defined as the organization providing financial support for a study). We categorized sponsors into industry, academia, or both; and funders into industry, public, or mixed. When this information was not available from the published literature, we searched Clinicaltrials.gov; if unavailable there, we contacted the corresponding author. Results were analyzed descriptively.

Among 57 NCCN-recommended interventions, 39 (68%) were based on at least one RCT, of which 19 (49%) showed an improvement in overall survival in 26 RCTs published between 1990 and 2017 (**Table**). These 19 interventions included the same drug in different settings (e.g., pembrolizumab as first-line and second-line treatment). Combining these, there were 17 distinct interven-

About This Column

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The Journal of Law, Medicine & Ethics, 47 (2019): 465-467. © 2019 The Author(s)
DOI: 10.1177/1073110519876182

Table 1

Interventions listed in NCCN guidelines for non-small cell lung cancer that have evidence of improving survival in randomized controlled trials

Intervention	Number of randomized controlled trials	Maximum benefit observed	Sponsorship	Funding
Curative Setting				
Radiotherapy +/- chemotherapy	4	5-year overall survival difference of up to 11%; best HR 0.69	Academia for 3, Industry for 1	Public for 3, Industry for 1
Surgery + chemotherapy (adjuvant/neoadjuvant/ perioperative)	6	5-year overall survival difference of up to 19%; best HR 0.43	Academia for 4, Industry for 2	Public for 3, Industry for 2, Mixed for 1
Noncurative setting				
Chemotherapy	6	Median overall survival difference of up to 3.9 months; best HR 0.73	Academia for 3, Industry for 3	Public for 3, Industry for 3
Non-chemo cancer drugs (angiogenesis inhibitors, targeted drugs, and immunotherapies)	9	Median overall survival difference of up to 4.2 months; best HR 0.59	Academia for 1, Industry for 8	Industry for 8, Mixed for 1
Palliative care	1	Median overall survival difference of up to 2.7 months; HR 0.59	Academia	Public

HR=hazard ratio, OS=overall survival.

tions improving overall survival in lung cancer.

Of the 17 interventions, 5 (29%) improved overall survival in the curative setting, and 12 (71%) improved overall survival in the non-curative setting. The best overall survival gains were obtained in the curative setting: radiotherapy plus chemotherapy improved 5-year overall survival rates by up to 11%; and chemotherapy coupled with surgery improved 5-year overall survival rates by up to 19%. In the non-curative setting, the best overall median survival gains were observed with chemotherapy (3.9 months), non-chemo drug therapy (4.2 months) and the addition of early palliative care to standard care (2.7 months [one RCT]). The lowest hazard ratios for overall survival obtained in the curative settings were 0.69 for radiotherapy and 0.49 for chemotherapy, whereas the lowest hazard ratios in the metastatic setting were 0.73 for chemotherapy, 0.59 for non-chemo drug therapy, and 0.59 for palliative therapy.

Of the 26 RCTs, academic groups sponsored 12 (46%), and industry sponsored 14 (54%). Among the academic group-sponsored RCTs, funding came primarily from public sources (n=10, 83%) but also from combined government/industry sources (n=2, 17%). Funding for the 14 industry-sponsored RCTs came from industry sources alone. More than three-fourths of industry-sponsored RCTs (n=11, 79%) were drug trials in the non-curative setting, whereas academia-sponsored RCTs spanned a range of interventions, with more than half (n=7, 58%) in the curative setting.

Among RCTs of interventions found to improve overall survival in NSCLC, academic sponsorship or public funding was identified in about half. Most of these RCTs were of non-drug interventions in the curative setting, in which the greatest overall survival gains were observed. By contrast, industry-sponsored RCTs focused almost exclusively on new cancer drugs in the non-curative set-

While reaffirming the important contribution that industry makes in funding RCTs for developing new drugs to treat advanced disease, these findings also reveal the critical role that academic groups and public funding plays in identifying interventions that yield the biggest public health benefits, highlighting the value of continued public funding and support of academic trials.

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ting, in which more modest overall survival gains were observed.

A limitation of the study was its reliance on publicly disclosed information in publications or on Clinicaltrials.gov regarding trial sponsorship and funding. Another limitation is that although the study focused only on overall survival benefits, other endpoints such as quality of life may be of value even in the absence of overall survival benefits.

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Note

Drs. Kesselheim and Sarpatwari's work is supported by grants from Arnold Ventures, the Harvard-MIT Center for Regulatory Science, the Engelberg Foundation, and the Open Society Foundations.

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