

Lung Cancer

Summary of Cost – effectiveness studies

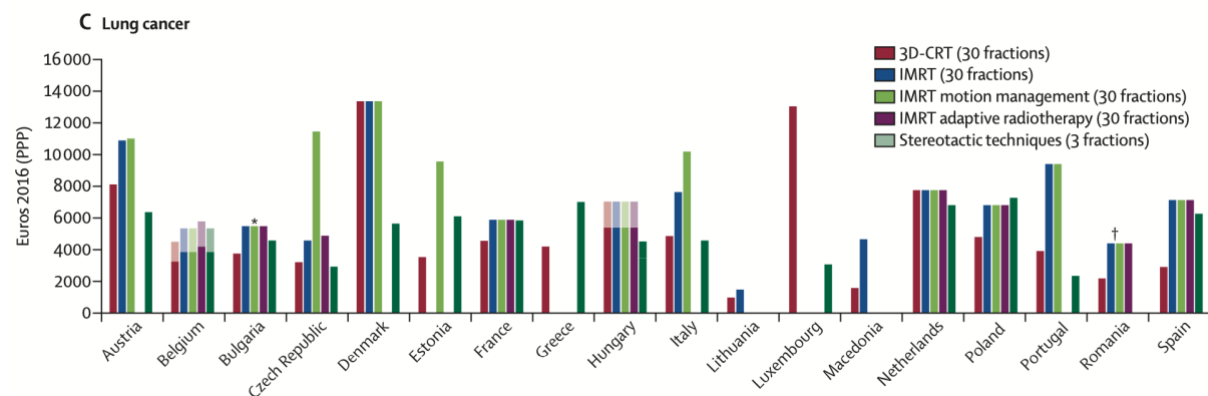
Dr Nicolas CHRISTIAN, MD, PhD
Service de radiothérapie oncologique
Réseau HELORA Mons/La Louvière – Site Jolimont

Introduction

Studies on radiotherapy cost-effectiveness in the treatment of lung cancer have been carried out both in the European and in the Belgian context.

A large comparative study published in 2020 in the Lancet Oncology Review shows annual expenditure for Belgian radiotherapy corresponding to 6.4% of the overall expenditure of the total oncology budget, lower than the European average of 7.8%.

The situation regarding lung radiotherapy is shown in this graph (1).



Moreover, radiotherapy treatment in Belgium costs on average € 6,221, which is significantly less than in other countries, such as the USA, where this treatment is billed at \$ 10,000 to \$ 15,000. Economic evaluation studies carried out in other countries should therefore be read in this light, which improves the cost-effectiveness of radiotherapy in Belgium (2).

In pulmonary radiotherapy, 3 situations are conventionally addressed in studies

- Pulmonary stereotaxis (SBRT): corresponds to short, high-dose radiotherapy, in 3 to 8 sessions. It is indicated for the treatment of early stage lung tumors (small isolated lung lesions).
- Fractional conventional radiotherapy (between 20 and 30 sessions): used for the treatment of advanced lung tumors (large tumors associated with metastatic lymph nodes at the mediastinal level), possibly in combination with chemotherapy or immunotherapy.

- Palliative radiation therapy: used to relieve the presence of a symptom in a patient with an incurable disease.

A major cost-effectiveness study in lung cancer was carried out in 2019 by the National Institute for Health and Care Excellence (NICE) in the United Kingdom. These findings, along with those from other studies, are summarized below (3).

1. General studies

A Canadian study published in 2004 concluded in a considerable gain of radiotherapy in the curative management of lung cancer, all situations combined, with a very favorable cost-benefit ratio. The average cost was 9881 dollars per life year gained, far below the common cut off of 50,000 dollars per life year gained used in this study (4).

2. Pulmonary stereotaxis.

The English NICE report, and other studies have demonstrated the excellent cost-benefit ratio of pulmonary stereotaxic RT for the treatment of early stage tumors in inoperable patients (compared to supportive care or radiofrequency). (3,5,6)

In operable patients, studies diverge. Stereotaxis is globally comparable to lobectomy surgery, sometimes assessed identically, superiorly, or inferiorly (7-9). A recent Dutch study demonstrates the superiority of stereotactic radiotherapy in most situations (8).

3. Fractionated radiotherapy

Constitutes standard treatment in advanced diseases, without any other competing treatment. Radiotherapy is absolutely superior to supportive care (3,4).

In regimens without associated chemotherapy, shortened radiotherapy treatments are more cost-effective than conventional radiotherapy in 30 fractions (10, 11).

The cost-benefit ratio of consolidation radiotherapy after chemotherapy is evaluated variably depending on the situation (positive in the event of consolidation for a small cell tumor, negative in certain tumor subtypes under targeted therapy for maintenance) (12, 13).

4. Palliative radiotherapy

Palliative treatments can relieve symptoms presented by patients in an incurable situation. The cost-benefit ratio in this situation is favorable compared to supportive care alone (14).

Conclusion

The economic evaluation studies are consistent. The cost-effectiveness of pulmonary radiotherapy is favorable, both for stereotactic radiotherapy treatments and for fractional radiotherapy.

Bibliography

1. Lievens Y et al, How public health services pay for radiotherapy in Europe: an ESTRO–HERO analysis of reimbursement, *Lancet Oncol*, 2020, volume 21, issue 1, e42-e54.
2. Lievens Y et al, Stereotactic body radiotherapy for lung cancer: how much does it really cost? *J Thorac Oncol*, 2015 Mar;10(3):454-61.
3. Evidence reviews for the clinical and cost effectiveness of different radiotherapy regimens with curative intent for NSCLC Lung cancer: diagnosis and management, NICE Guideline, No. 122, NICE Guideline Updates Team (UK). London: National Institute for Health and Care Excellence (UK); 2019 Mar. ISBN-13: 978-1-4731-3307-5.
4. Barbera L. et al, Estimating the benefit and cost of radiotherapy for lung cancer, *Int J Technol Assess Health Care*, Fall 2004;20(4):545-51
5. Lanni T. et al., Stereotactic radiotherapy reduces treatment cost while improving overall survival and local control over standard fractionated radiation therapy for medically inoperable non-small-cell lung cancer, *Am J Clin Oncol*, 2011 Oct;34(5):494-8.
6. Sher D., Cost-effectiveness analysis of stereotactic body radiotherapy and radiofrequency ablation for medically inoperable, early-stage non-small cell lung cancer. *Int J Radiat Oncol Biol Phys*, 2011 Dec 1;81(5):e767-74.
7. Paix A, et al., Cost-effectiveness analysis of stereotactic body radiotherapy and surgery for medically operable early stage non small cell lung cancer. *Radiother Oncol*, . 2018 Sep;128(3):534-540.
8. Wolff H. et al., Cost-effectiveness of stereotactic body radiation therapy versus video assisted thoracic surgery in medically operable stage I non-small cell lung cancer: A modeling study. *Lung Cancer*, 2020 Mar;141:89-96.
9. Shah A. et al., Cost-effectiveness of stereotactic body radiation therapy versus surgical resection for stage I non-small cell lung cancer. *Cancer*, 2013 Sep 1;119(17):3123-32.
10. Ramaekers L et al., Cost effectiveness of modified fractionation radiotherapy versus conventional radiotherapy for unresected non-small-cell lung cancer patients. *Thorac Oncol*, 2013 Oct;8(10):1295-307.
11. Bongers M. et al. Model-based cost-effectiveness of conventional and innovative chemo-radiation in lung cancer. *Int J Technol Assess Health Care*. 2017 Jan;33(6):681-690.
12. Evidence reviews for the clinical and cost-effectiveness of first use of thoracic radiotherapy for people with extensive-stage SCLC who have had first-line treatment with systemic anti-cancer therapies: Lung cancer: diagnosis and management. NICE Guideline Updates Team (UK), London: National Institute for Health and Care Excellence (UK); 2019 Mar.
13. Kim H., Cost-Effectiveness Analysis of Upfront SBRT for Oligometastatic Stage IV Non-Small Cell Lung Cancer Based on Mutational Status. *Am J Clin Oncol*, 2019 Nov;42(11):837-844.
14. Coy P., The cost-effectiveness and cost-utility of high-dose palliative radiotherapy for advanced non-small-cell lung cancer. *Int J Radiat Oncol Biol Phys*, 2000 Nov 1;48(4):1025-33.