HPI

Modelling the impact on Lung Cancer Life Years Gained of universal screening for lung cancer amongst defined high-risk populations in Greece versus the current scenario of background (opportunistic) screening

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Background

Lung Cancer (LC) is the most common type of cancer diagnosed in Greece, accounting for 13.9% of total new cancer cases and, by far, the biggest cancer-related killer (23.1% of deaths)[1].

Despite this high epidemiological burden, the country does not implement a national lung cancer screening strategy.

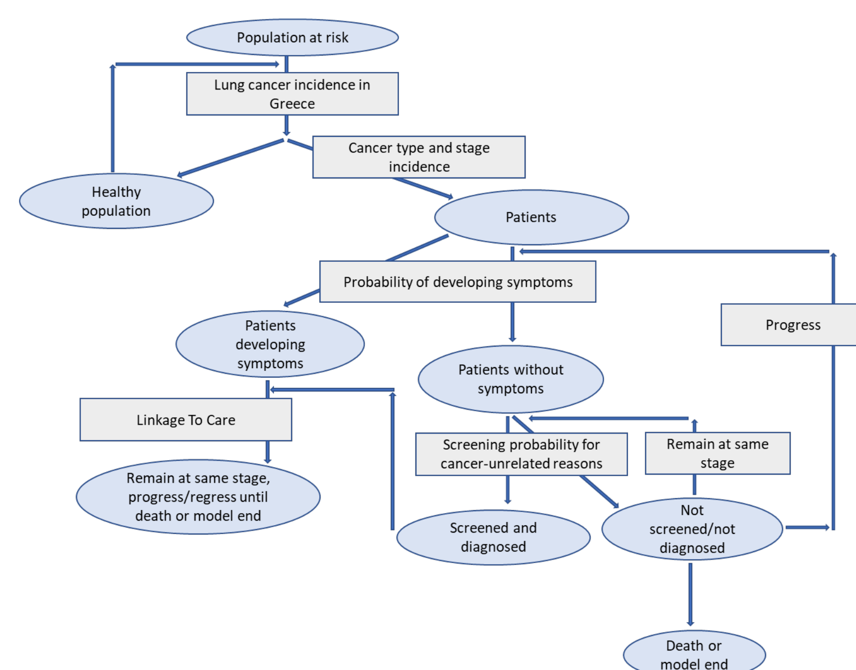
Objectives

To estimate the impact on lung cancer life years (LCLYs) of a hypothetical scenario, where 100% of high-risk population, as defined by the US Preventive Services Taskforce[2], i.e., aged 50-80, firsthand (20 pack-years) or ex-smokers (quit within the past 15 years) are screened and linked to care (SLTC) for lung cancer versus the current scenario of background (opportunistic) screening only.

Methods

- We developed a cohort stochastic model to monitor a hypothetical cohort of 100,000 high-risk men and women aged 50-80 firsthand smokers (20 pack-years) or ex-smokers (have quit within the past 15 years) over a time horizon of 5 years.
- Probabilities of transitioning from a health state to another (without cancer, with cancer, alive, dead) were based on clinical expert opinion.
- We modelled expected outcomes (cancer cases, deaths, lost LYs) in the current and the hypothetical scenario, and
- We calculated difference in outcomes (lung cancer life years lost / gained) between the two scenarios.

Model Schema



Scenarios

- We analyzed 2 screening and disease management scenarios (Table 1): a **current scenario**, where a high-risk person may undergo a random cancer-unrelated screening or experience symptoms after being assigned the probability to be a lung cancer patient, and a **hypothetical scenario**, in which all high-risk persons are screened for lung cancer upon entry in the model.
- In both scenarios, post screening, patients are linked to treatment until death or model time end, whichever occurs first.
- 150 iterations of simulation scenarios were conducted for 100,000 persons each and means and standard deviation (SD) calculated.

Table 1. Scenario comparison overview

	Screening and diagnosis	Linkage to care and treatment	Results
Current scenario	Opportunistic screening	Post diagnosis according to clinical guidelines (assumed optimal available)	Deaths due to lung cancer Lost LYs due to lung cancer
Hypothetical scenario	100% of high-risk population aged 50-80		

Results

The hypothetical scenario led to improved outcomes, in terms of fewer deaths (-24.56%) and less life years lost (-31.01%) over 5 years.

Table 2. Current scenario modelling results

parameter	Mean Value	SD
Cancer cases	1,922.64	45.89
Cancer-related deaths	1,365.77	35.13
Lost years	3,037.62	89.59

Table 3. Hypothetical scenario modelling results

parameter	Mean Value	SD
Cancer cases	1,925.55	41.00
Cancer-related deaths	1,031.89	31.54
Lost years	2,098.85	77.37

Table 4. Comparison between modelling results for the two scenarios

parameter	Difference (%)	P-value
Cancer-related deaths	-24.56%	<0.001
Lost years	-31.01%	<0.001

Increasing SLTC leads to a statistically significant reduction in deaths and in total years lost due to lung cancer when compared with current SLTC paradigm.

Discussion

This modelling study estimates the clinical impact in terms of deaths averted and life years gained from applying a 100% SLTC strategy to a cohort of LC high-risk persons aged 50-80 in Greece.

Over 5 years, the model predicts a difference of 333 deaths and 938 death years between hypothetical and current scenarios.

Our model also indicates that applying the hypothetical scenario leads to a substantial shift to lower-stage cancers at the time of diagnosis – this allows for a more frequent eligibility for curative treatment (mainly surgical).

Despite being a stochastic model based on clinical expert opinion, our findings are in line with the recently published outcomes of the NELSON clinical tria[3].

Conclusions

- Our study suggests that applying a 100% screening strategy amongst high-risk adults aged 50-80, would result in additional averted deaths and gained LCLYs over 5-years in Greece.

References

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