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Original Research

The use of intensive radiological assessments in routine surveillance after treatment for head and neck cancer: An economic evaluation

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Abstract ***Background:*** There is uncertainty around the optimal surveillance of head and neck cancer patients after the primary curative treatment. This study aims at assessing the cost-effectiveness of a post-treatment programme of frequent radiological assessments (maximal approach) compared with a symptom-driven surveillance (minimal approach).
Materials and methods: A decision-analytic Markov model is developed to assess the cost utility of two alternative follow-up programmes with a lifetime horizon. The two interventions differ in the number of radiological assessments (i.e. magnetic resonance imaging, computed tomography and positron-emission tomography) performed over a 5-year period. Clinical and utility parameters are derived from published and unpublished literature and expert opinion. The cost analysis is conducted from the perspective of a major Italian region's health care system. Cost-effectiveness results are expressed as incremental cost per life year gained (LYG) and per quality-adjusted life year (QALY) and checked against a cost-effectiveness threshold of €25,000–40,000 per QALY. One-way, two-way and probabilistic sensitivity analyses are carried out.
Results: In the base-case analysis, an intensive programme of radiological investigations leads to 0.10 additional QALYs (0.15 LYG) and an increase in costs of €1903 per patient compared with those of a minimal option, resulting in an incremental cost of €19,951/QALY gained (€13,123/LYG). In probabilistic sensitivity analysis, 72% of the results lie below the €40,000 threshold (55% below €25,000).

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Conclusions: An intensive post-treatment follow-up with scheduled radiological assessments over time might be cost-effective compared with symptom-driven surveillance in head and neck cancer patients. Further research is needed to check these results in empirical studies or real-world settings.

1. Introduction

Head and neck cancer (HNC) is the sixth most common cancer worldwide; in Europe alone, around 143,000 people are diagnosed and more than 68,000 die each year because of the disease [1]. The incidence in Italy is about 16 cases per 100,000 population [2]. Despite the routine introduction of combined modality treatment, the 5-year overall survival rate is 40–60% [2–4], and up to 50% of patients relapse with locoregional or metastatic recurrences [4–6]; additionally, a constant rate of 2–3% per year of second primaries is observed [7].

A few patients with locoregional recurrences or second primaries can be salvaged by a potentially curative treatment (i.e. surgery or re-irradiation) [1,4], while most are only suitable for palliative treatment usually including a combination of chemotherapeutics and anti-epidermal growth factor receptor drugs [8]. The prognosis for patients with recurrent or metastatic disease not eligible for curative treatment is very poor, with a median overall survival of around 10 months under the standard scheme of platinum-based chemotherapy plus cetuximab [9].

A post-treatment follow-up programme is essential in the first few years after the primary treatment to identify potentially curable relapses, as well as monitoring long-term therapy-related side-effects. However, there is no consensus in the medical community around the optimal strategy. Published recommendations are mostly based on retrospective studies and expert opinions, while the added value of intensive radiological assessment over a scheme based on self-reported symptoms (e.g. pain, dysphagia, hoarseness) has not yet been confirmed in any prospective study.

This study evaluates the cost-effectiveness of an intensive follow-up strategy (maximal approach) versus a symptom-driven surveillance (minimal approach) using a modelling framework.

2. Materials and methods

A decision-analytic Markov model is developed to assess the long-term health and economic consequences of two different surveillance schemes. A randomised controlled trial (Health and Economic Outcomes of Two Different Follow up Strategies in Effectively Cured Advanced Head and Neck Cancer [HETeCo], clinicaltrials.gov identifier NCT02262221) is currently being conducted in Italy and Switzerland to compare an intensive versus a non-intensive follow-up programme of equal length (i.e. 5 years). The trial started in 2014 and is expected to be completed by 2020; therefore, it is mainly used to generate a research question, while most of the data are obtained from other sources.

2.1. HETeCo trial

The full trial protocol is available at clinicaltrials.gov. Briefly, patients with a diagnosis of clinical or pathological stage III–IV squamous HNC in the oral cavity, oropharynx, larynx or hypopharynx and without evidence of disease 6 months after having received radiotherapy with curative intent (alone or with systemic therapy or in post-operative setting) are randomly allocated to one of the two follow-up programmes.

The non-intensive follow-up (arm A, minimal approach), designed according to the National Comprehensive Cancer Network (NCCN) guidelines [10], comprises several outpatient visits during which patients receive both physical and fibre optic endoscopic examinations; laboratory tests are performed once a year. Radiological assessment through magnetic resonance imaging (MRI) or computed tomography (CT) is performed within 6 months of completion of treatment and then, only at the occurrence of new signs or symptoms. Patients are contacted by phone between visits to monitor any health changes and instructed how to recognise them.

The alternative strategy (arm B) is a more intensive follow-up (maximal approach) where outpatient visits and laboratory tests are performed similarly to the arm A. Imaging tests are scheduled for all patients twice a year in the first 2 years and annually in the third and fourth years; MRI is preferred over CT for all subsites except for laryngeal cancer. Positron-emission tomography (PET) scans are performed annually in the first 3 years in high-risk patients.

2.2. Model structure

The Markov state-transition model (Fig. 1) simulates the experience of a hypothetical cohort of 1000 patients after being treated for primary stage III–IV HNC; mean age and gender ratio are representative of the patients