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Full Length Article

The secondary care (hospital) cost of treating and rehabilitating patients with head and neck cancer

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ABSTRACT

Background: The cost of head and neck cancer treatment is of interest to clinicians and providers. The aim of this work was to estimate the costs of treating and rehabilitating patients following different head and neck cancer diagnoses.
Design: A single-centre retrospective cohort study using purposive sampling of patient records. Patient-level costing was performed using the hospital's Patient Level Information and Costing System (PLICS), capturing costs across surgical, radiotherapeutic, and oral rehabilitation pathways.
Results: Ten patients were included. Treatment costs ranged from £15,560 to £69,536. Advanced-stage cancers were costly, requiring multi-modality treatment and complex oral rehabilitation. Primary dental implant placement was more cost-effective than delayed placement.
Conclusion: There is substantial variability in the cost of curative treatment and oral rehabilitation for head and neck cancer. Stage at diagnosis and modality of rehabilitation significantly influence total cost. These findings support the economic rationale for early detection and standardised rehabilitation protocols.

1. Introduction

NHS England Cancer Registration Statistics from 2022 suggest an incidence of head and neck cancer (excluding thyroid) of over 11,000 per year [1]. Most of these cancers are squamous cell carcinomas of the oropharynx, oral cavity or larynx [1]. Oral health outcomes are influenced by the stage of presentation [1,13], with late-stage presentation necessitating multi-modality treatments for cure [2,3] and extensive and lengthy oral rehabilitations [4–7]. There is limited research investigating the cost of treating patients who present at different stages. Published research focusses on the remuneration rate for head and neck cancer and, therefore, the cost to NHS England [8]. This, however, assumes that the reimbursement tariff reflects the true cost of treatment. This is unlikely to provide a representative cost of treatment given inflationary changes over the past 5 years and the relative stagnancy of treatment reimbursement. Per patient costs have been investigated, however there are no recent publications [9–11]. Consequently, much of this data no longer maintains external validity. We sought to examine both the total cost of care, as well as the cost of oral rehabilitation. This aims to optimise the external validity and relevance of this research to the healthcare environment in the United Kingdom presently.

2. Methods

Purposive sampling was employed to select ten patients from MDT records, ensuring diversity in diagnosis, stage, and treatment modality. Inclusion criteria were:

- Curative intent treatment
- Completion of treatment and rehabilitation
- No recurrence or treatment failure
- Single primary diagnosis

Care timespan between diagnosis and completion of oral rehabilitation in the hospital setting determined the research follow-up time. Key parameters of care, such as the specialties involved, were determined. This information was utilised to screen all in patient and outpatient episodes to identify episodes of care associated with the

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cancer diagnosis. Each episode of care was analysed and costs were calculated using PLICS (Patient Level Information Costing System). This uses a host of electronic data to allocate an appropriate cost to the different stages of a patient's treatment pathway.

3. Results

The cohort included:

- Oral and oropharyngeal cancers treated with surgery and/or radiotherapy
- Rehabilitations including obturators, ZIP flaps, dentures, and implants, and both primary and delayed implant placements

The range of cases was limited by the treatment modalities utilised within the cancer centre. The cost for 525 items of care were used for the analysis, with the 419 of these being "non-specified procedures" associated with the holistic care of patients beyond discrete or surgical outpatient costs. This process encompasses costs that may otherwise be overlooked, such as the cost of clinical photography.

3.1. Cost breakdown

- Total cost range: £15,560–£69,536
- Oral rehabilitation: £474–£24,843 (1 %–58 % of total cost)
- Highest costs associated with composite free flap reconstruction and delayed implants
- Primary implant placement was more cost-effective (£14,679 vs. £20,544)

The total cost of care varied between £15560 and £69536. A higher surgical cost of care was attributable to reconstruction with a free flap. The cost of restorative dentistry varied between £474 and £24843; this represents between 1 % and 58 % of the total cost of care. A higher proportional cost of restorative care was attributable to the cost of rehabilitating maxillary resections, with both ZIP flap reconstruction and obturator being associated with a similar *proportional* cost of care (58 % and 57 % respectively). Despite this, oral rehabilitation with primary dental implants was found to be more cost effective and time efficient than a delayed oral rehabilitation (£14,679 for dental implants placed primarily in a case requiring composite flap reconstruction vs. £20,544 for an otherwise comparable case). The higher costs of surgery and restorative oral rehabilitation was attributable to the larger and more complex rehabilitation burden associated with later stage cancers. This is also observed in the varying cost for a dental implant rehabilitation, with larger and more complex rehabilitations having a higher cost. The lowest cost for a restorative oral care including a dental implant rehabilitation was £2961, whereas the highest such cost was £24843. This resulted in a higher cost of restorative oral rehabilitation, despite a shorter timescale. These data are summarised in Table 1. These costs represent care over a 14-month time period, thus representing acute and short-term rehabilitative care only. The follow-up timescale included the completion of oral rehabilitation for all patients.

3.2. Stage-based cost

The cost of care varied between stage of diagnosis. The median cost of care was £37201 for SI cancers, £54174 for SII cancers, £60376 for SIII cancers, and £59003 for SIV cancers. These data are summarised in Fig. 1.

4. Discussion

This study reveals significant cost variability in HNC treatment, driven by stage, modality, and rehabilitation complexity. Late-stage cancers incur higher costs due to extensive surgery, radiotherapy, and complex oral rehabilitation. These findings align with clinical expectations and underscore the economic burden of delayed diagnosis.

We have identified a curative treatment cost of between £15,000 and £60,000 for head and neck cancers. These data show higher costs for treating cases with a later stage of presentation in a manner that reflects clinical treatment norms.

This supports the *potential* value of early diagnosis interventions such as awareness campaigns and screening programmes. The health economic value of such programmes remains unknown and outwith the scope of this preliminary study. Furthermore, the presented data represent a small cohort treated by a single hospital trust. A larger multicentre study sample is required to improve the external validity. Despite this, the authors accept that it is challenging to obtain accurate patient level cost data that represents the cost of treatment, rather than the tariff

Table 1
A summary of the per case costs of treatment based on treatment component.

Case type	Cost of surgical care (including associated planning and follow-up)	Cost of radiotherapy (and chemotherapy where appropriate)	Cost of restorative care	Additional costs	Total cost
Maxillary cancer treated with resection, and obturator	£6355	N/A	£8874	£331	£15560
Maxillary cancer treated with resection, and rehabilitated using the ZIP flap technique	£17909	N/A	£24843	£172	£42924
Oral cancer with soft tissue resection and denture reconstruction	£46563	N/A	£4927	£2683	£54173
Oral cancer with soft tissue resection and implant reconstruction (primary dental implants)	£43634	N/A	£15648	N/A	£58282
Oral cancer with soft tissue resection, radiotherapy and implant reconstruction (primary dental implants)	£38888	£16380	£2961	£2146	£60375
Oral cancer treated with soft tissue resection and adjuvant radiotherapy, and no oral rehabilitation (beyond prevention)	£40173	£20944	£474	£1631	£63222
Oral cancer treated with soft and hard tissue resection, composite free flap and implant reconstruction (primary dental implants)	£45044	N/A	£14679	N/A	£59723
Oral cancer treated with soft and hard tissue resection, composite free flap and implant reconstruction (delayed dental implants)	£45112	£2087	£20544	£1793	£69536
Oropharyngeal cancer treated with surgery and adjuvant radiotherapy, and no oral rehabilitation (beyond prevention)	£13304	£19465	£474	£1545	£34788
Oropharyngeal cancer treated with radical radiotherapy, and no oral rehabilitation (beyond prevention)	£1737	£34715	£474	£2686	£39612

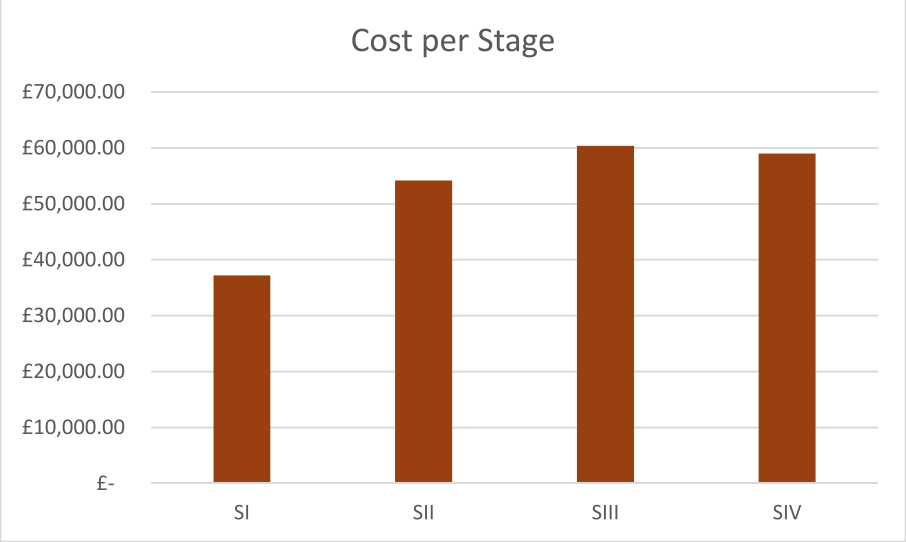

Fig. 1. A summary of the total cost of cancer care, including rehabilitation, for head and neck cancers of different stages.

paid to hospitals.

Contrary to other international publications, we identified a higher cost for rehabilitating patients with dental implants than with conventional dentures [6]. We attribute this to the higher component/materials cost associated with dental implant treatments. We also attribute this to the relative complexity of the cases presented, with later stage cancers being associated with larger resections, loss of more teeth, and therefore larger and more complex implant rehabilitations. Whilst further research to explore the quality of life differences between these two rehabilitation types would be beneficial to health economic analysis, it remains uncertain whether any published quality of life tools are appropriate for this purpose [12,14,15].

These data also highlight the potential to reduce the cost of care in the provision of head and neck cancer resections and oral rehabilitations. The most complex surgical procedures now routinely utilise virtual surgical planning, guided surgery and implant treatments, all of which commonly rely on external care providers for planning and materials. None of these services adopt a national procurement framework at the present time.

5. Conclusion

Patient-level costing reveals wide variability in HNC treatment costs, with oral rehabilitation comprising a significant proportion. These insights are critical for health economic planning, service optimisation, and policy development aimed at improving outcomes and reducing costs through early intervention.

Ethics statement/confirmation of patient permission

N/A.

Statement of significance

Oral cancer has profound impacts on the structure, function and appearance of the oro-facial structures. Furthermore, this cancer commonly presents in the late stages of disease, resulting in poorer survival and increased treatment costs for achieve cure.

The cost of care is critical to understanding the health economic impacts of head and neck cancer diagnoses, and such data is currently lacking. Prior publications are either now outdated, or have focused on tariff costs (what is paid to hospitals), rather than the true cost of care to health care providers.

We undertook a patient level costing analysis to determine the cost of care, for both curative treatment and oral rehabilitation, for a range of head and neck cancer diagnoses. These encompassed various subsites and stages at diagnosis.

We believe that this publication will be beneficial to individuals searching for health economic data relating to head and neck cancer. We plan to publish further articles following this exploring this field.

Thank you for your consideration of this article.

All authors have contributed to the publication as outlined below:

Jaymit Patel: Conception and design, Acquisition of data, Analysis and interpretation, Drafting/revision of article, Final approval.

Anastasios Kanatas: Conception and design, Drafting/revision of article, Final approval.

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Conflict of interest

None.

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