Available online at www.sciencedirect.com
ScienceDirect
EJSO
the Journal of Cancer Surgery
EJSO 41 (2015) 758–765
www.ejso.com

Initial attributable cost and economic burden of clinically-relevant differentiated thyroid cancer: A health care service provider perspective

B.H.-H. Lang [a,*], C. KH Wong [b], C. TY Chan [c]

[a] Department of Surgery, University of Hong Kong, Pokfulam, Hong Kong Special Administrative Region
[b] Department of Family Medicine and Primary Care, University of Hong Kong, 3/F Ap Lei Chau Clinic, 161 Main Street, Ap Lei Chau, Hong Kong Special Administrative Region
[c] Department of Surgery, Pamela Youde Nethersole Eastern Hospital, Hong Kong Special Administrative Region

Accepted 26 January 2015
Available online 31 January 2015

Abstract

Background: Rapid rise in differentiated thyroid cancer (DTC) may impose a heavy economic burden on future healthcare. We aimed to calculate the average first-year monetary cost/patient for DTC and estimate the projected cost burden on our local healthcare system.
Methods: Medical records of 270 clinically-relevant DTC patients were reviewed to calculate the amount of services utilized during the first-year. Only direct costs were included with estimates derived from government gazette. Cancer incidences were derived from the territory-wide cancer registry. Total annual cost equaled to the incidence multiplied by the cost/patient.
Results: The average first-year cost of DTC was USD11,560/patient. Initial surgery accounted for 66.9% of total cost. Male and female annual percentage increases for DTC were 4.86% and 4.28%, respectively. Female DTC is projected to surpass rectal cancer in 2019 (20.4/100,000 vs. 20.0/100,000) and colon cancer (47.2/100,000 vs. 46.8/100,000) in 2039. However, the projected incidence of DTC in 2026 would still be about one fourth that of CRC (19.5/100,000 vs. 83.2/100,000).
Conclusions: The average first-year monetary cost of DTC care was relatively low. Initial surgery accounted for most of the cost. Despite a rapid incidence rise, the projected first-year cost for DTC is unlikely to impose substantial economic burden on our local future healthcare system.

Keywords: Economic burden; Cost effectiveness; Thyroidectomy; Thyroid cancer; Cancer incidence

Introduction

Differentiated thyroid cancer (DTC) accounts for over 90% of all follicular-cell derived thyroid malignancies and comprises papillary (PTC) and follicular thyroid cancers with an overall 10-year cancer-specific survival of over 90–95%. However, despite its good prognosis, an increasing incidence of DTC has been reported in different parts of the world.[1–4] In the US, the incidence has increased from 4.9/100,000 in 1975 to 13.0/100,000 in 2008 and is increasing at a rate faster than any other cancers.[2] It is believed to be a result of increasing surveillance and use of diagnostics.[1–7] This rapid increase inevitably imposes greater economic burden on future healthcare.[8,9] This issue is particularly relevant in the context of cost containment and sustainability.[10] To date, several studies have estimated the actual monetary cost of DTC care.[8,11–14] However, studies have predominantly based on analysis of large population-based linked databases in the US (such as the Surveillance, Epidemiology and End Results or the SEER).[11–14] Although these databases comprise large patient cohorts, not all expenditures captured were directly attributable to DTC care.[14–16] Furthermore, studies have been unable to separate expenditure used for treating clinically-relevant DTC from the commonly-encountered incidental occult microcarcinoma (tumor ≤1 cm) or less-differentiated thyroid

* Corresponding author. Division of Endocrine Surgery, Department of Surgery, Queen Mary Hospital, 102 Pokfulam Road, Hong Kong Special Administrative Region. Tel.: +852 22554773; fax: +852 28172291.
E-mail address: blang@hku.hk (B.H.-H. Lang).

http://dx.doi.org/10.1016/j.ejso.2015.01.019
0748-7983/

carcinoma.[11–14] Therefore, there might have been an overestimation of the actual cost for clinically-relevant DTC. To obtain a more accurate attributable cost in clinically-relevant DTC, the gold standard remains the more labor-intensive clinical chart review or micro-costing collection method.[15–17] However, to our knowledge, there has not been a study attempting to estimate cost of DTC care using this method. The present study aimed firstly to calculate the average first-year attributable cost/patient of DTC care by micro-costing and secondly, to estimate the actual and projected total cost of DTC care in our territory and its relative impact on future healthcare expenditure.

Patients and methods

Patients

From 2006 to 2010, 357 consecutive patients with DTC underwent thyroidectomy at Queen Mary Hospital in Hong Kong. Thirty-six (10.1%) patients with occult microcarcinoma (tumor size ≤1 cm) managed during this period were not included as they were incidentally found and had little to no bearing on patient survival. To be eligible for analysis, patients had to be managed at our institution throughout the entire first year of the 3-phase patient journey (i.e. from the first consultation to diagnosis, treatment and follow-up). Altogether 270 (75.6%) patients were eligible and analyzed.

Methods

The record of these patients were reviewed independently by two reviewers (BHL,CTC) to estimate the amount of services utilized during the first year of DTC care. Number of consultations/clinic visits, blood tests, investigations, procedures, type and duration of complications and treatments considered directly related to DTC care were recorded on a standardized form. Results from each reviewer were then compared and disagreements were resolved by consensus.

To estimate the amount of services utilized before and after thyroidectomy, the entire first year of the patient journey was divided into 3 phases, namely diagnosis (or pre-operative assessment), treatment (surgery and adjuvant treatment) and follow-up (including diagnostic whole body scan (WBS)). The diagnosis phase was from first consultation up to the day before definitive operation. The treatment phase was from day of definitive operation to the last initial treatment which was usually radioiodine ablation (RAI) or external radiation therapy (ERT). The follow-up phase was from after the day after last initial treatment to the end of first year.

Patient management

Similar preoperative assessment, surgical treatment, RAI ablation and ERT criteria, postoperative and follow-up protocols were followed throughout the study period.[18,19] These protocols were similar to the recent guideline published by the American Thyroid Association.[19] Before surgery, whenever possible, diagnosis of DTC was made by fine needle aspiration cytology (FNAC) with or without ultrasound (USG) guidance. Surgery was recommended for malignant or suspicious FNAC or if at least 2 FNACs were indeterminate. Thyroid function and auto-antibodies, serum calcium and phosphate, lymphatic mapping of the neck by USG and direct laryngoscopy were routinely done before surgery. CT or MRI scans were only done for bulky cervical nodal metastases. The choice of preoperative blood tests and investigations was left at the discretion of the anesthetist in the pre-anesthetic clinic.

In the treatment phase, total thyroidectomy and prophylactic central neck dissection was the preferred procedure for DTC >1 cm. Concomitant lateral selective neck dissection was only performed for FNAC-proven lateral nodal metastasis. Frozen section was not routinely performed unless a positive result affected the extent of surgery. Both recurrent laryngeal nerves were routinely identified. Autotransplantation of any inadvertently removed parathyroid glands was readily performed. Serum calcium and phosphate levels were measured postoperatively. Calcium ± vitamin D supplements were prescribed if symptomatic or calcium <1.90 mmol/L. Those on calcium and/or vitamin D supplements were weaned off them as soon as possible. Those who discontinued supplements in the presence of normocalcemia within 6 months were considered temporary and those who needed for >6 months were considered permanent hypoparathyroidism. Direct laryngoscopy was performed routinely 1–2 days before and 1–2 weeks after primary operation. Those with vocal cord palsy (i.e. impaired or no vocal cord movement) were re-scoped every 6–8 weeks until full recovery. Vocal cord palsy lasting >6 months was regarded permanent. Two months after surgery, RAI ablation was given after LT4 withdrawal or with recombinant human TSH. Recombinant TSH injection was a patient-paid item. The decision for RAI ablation was based on risk factors including tumor size >1.5 cm, lymph node metastasis, age >45, extrathyroidal extension, microscopic postoperative residual disease in the neck and distant metastasis. Three giga-Becquerels (GBq) I131 was the standard fixed ablative dose while 5.5 GBq I131 was performed for extensive regional disease with or without distant metastases. Post-ablation WBS was done 4–7 days afterwards. ERT to the neck was given to extensive extrathyroidal tumor extension, incomplete resection, and/or extracapsular lymph node metastasis. ERT to metastatic sites was performed for symptomatic and unresectable bone or brain lesions.

In the follow-up phase, diagnostic WBS was performed 6 months after RAI ablation. A 3 mCi dose was administered 3 days prior to scanning after LT4 withdrawal or stimulation with recombinant human TSH. Before diagnostic WBS, thyroid function, thyroglobulin, thyroid auto-