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Cost-benefit analysis of establishing and operating radiation oncology services in Fiji☆

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ABSTRACT

Background: Rising demand for services of cancer patients has been recognised by the Government of Fiji as a national health priority. Increasing attention has been paid to the lack of service of radiation therapy or radiotherapy in Fiji.
Objective: This study aims to estimate and compare the costs and benefits of introducing radiation oncology services in Fiji from the societal perspective.
Methods: Time horizon for cost-benefit analysis (CBA) was 15 years from 2021 to 2035. The benefits and costs were converted to the present values of 2016. Estimates for the CBA model were taken from previous studies and expert opinions and data obtained from field visits to Fiji in January 2016. Sensitivity analyses with changing assumptions were undertaken.
Results: The estimated net benefit, applying the national minimum wage (NMW) to measure monetary value for life-year gained, was −31,624,421 FJD with 0.69 of benefit-cost (B/C) ratio. If gross national income (GNI) per capita was used for the value of life years, net benefit was 3,975,684 FJD (B/C ratio: 1.04). With a pessimistic scenario, establishing the center appeared to be not cost-beneficial, and the net benefit was −53,634,682 FJD (B/C ratio: 0.46); net benefit with an optimistic scenario was estimated 23,178,189 FJD (B/C ratio: 1.20).
Conclusions: Based on the CBA results from using GNI per capita instead of the NMW, this project would be cost-beneficial. Introducing a radiation oncology center in Fiji would have potential impacts on financial sustainability, financial protection, and accessibility and equity of the health system.

1. Introduction

Radiotherapy is a fundamental component of effective cancer treatment along with surgery and chemotherapy in low-and middle-income countries (LMICs) as well as HICs, and it is estimated that radiation therapy is to be required in 50–60% of newly diagnosed cases [1]. Demand for radiotherapy in LMICs can be substantial because of cancer presentation with advanced stages where radiotherapy is of great use and plays a larger role if surgery is not applicable. 50%–80% of breast cancers in LMICs were at advanced stages at diagnosis in comparison with 15% in high-income countries; 56% of cervical cancers in Bagalore in India were at later stages (stage III) compared with 15% in high-income countries [2]. However, there is a worldwide shortfall of radiotherapy services with more than 90% of the population in low-income countries lacking access to radiotherapy [3]. In low-resourced countries, expensive start-up costs and staff training would be barriers to the implementation of radiation therapy.

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In Fiji with a total population of 862,068, the premature adult mortality is high; the top three major causes of mortality in 2013 were circulatory diseases, endocrine/nutritional and metabolic diseases, and cancer [4]. According to the GLOBOCAN 2012, the number of cancer incidence in Fiji was 1135 in 2012 and expected to increase to 1194 in 2015, 1437 in 2025, and 1619 in 2035 [5]. Women took up approximately 70% of total incident cases, 50% of which were diagnosed with breast or cervical cancer. These two cancers appear to have the highest incidence rate, which might be due to relatively easy and inexpensive diagnostic methods, compared to that of other types of cancer; cancer incidence for men might be underestimated (for more information on cancer epidemiology, please see Appendix in Supplementary material).

The Fiji's national health system is publicly funded and delivered. In 2014, current health expenditure (CHE) per capita was $190.8 (current USD). Total health expenditure (THE) as a percentage of Gross Domestic Products (GDP) have remained fairly constant around 4% of GDP over the past two decades [6]. Health services are publicly provided free of charge or at low cost for all citizens. Public hospitals in Fiji include three divisional hospitals, 16 sub-divisional hospitals, and three specialty national hospitals; there are four private hospitals [7]. The three divisional hospitals with a total of 958 beds deliver a broad range of inpatient care and specialized outpatient care, including chemotherapy and palliative care [8]. Most citizens in Fiji seem to have reasonable service coverage of and fairly equitable access to basic health services in the public sectors based on their health needs. However, access to specialist services for more complex diseases seems to be inequitable, since the majority of specialist services are only available at divisional hospitals in urban areas, or in Suva [9]. At the same time, many specialized clinical services, including various chemotherapy treatments, neurosurgery, renal transplantation, radiotherapy, etc., are available neither in the public sector nor in the private sector in Fiji.

For cancer care in Fiji, basic services including Pap smear tests and referrals for suspected cancer patients are delivered at primary and secondary care levels; cancer diagnosis and treatment are provided at tertiary care facilities. Limited surgical oncology services are available at the divisional hospitals. A limited range of cancer chemotherapy and hormone therapy drugs are available for a limited number of regimes [10]. Radiotherapy is not available locally yet [10]. Palliative care for cancer patients at later stages has recently been started in Fiji [11].

Patients, who need cancer treatment not available in Fiji, are referred to other countries with government subsidies or with their own resources. In general, patients seeking for cancer treatment overseas receive the combination of several cancer treatment modalities with diagnosis, surgery and/or chemotherapy and/or radiotherapy according to a patient's medical need. Patients who have ability to pay are assumed to receive treatment including radiation therapy overseas mainly with their out-of-pocket money; it is difficult to identify the exact number of those patients. The number of cancer patients treated overseas funded by the Government is less than 5% of all cancer cases per year. For cervical cancer, 10–15% of the cervical cancer patients who need radiotherapy for cure and palliative care received radiotherapy overseas (10–15 cervical cancer patients per year); it can be assumed that other types of cancer patients have similar unmet needs.

For patients treated overseas with a government subsidy, overseas treatment committee decides which patients should be sent based on certain criteria and other conditions including the prognosis of the patient; but limited funding and delay in getting services are concerns. Average waiting period for the approval after application was 2–3 months; average waiting period from approval and actually receiving radiotherapy abroad is 3–4 months. On average, there are 150–170 applicants from all diseases per year. 20–25 cancer patients per year were referred to India, New Zealand, and Australia [12]. In most cases, cancer patients were referred to India due to low costs. Even when treatment costs are covered by the Government, patients should pay for transportation and accommodation for travels [11,12].

There are issues related to the overseas treatment program. First of all, the Government subsidy only covers medical costs. Therefore, even if a patient is selected, he/she needs to pay other costs such as airfares and accommodation expenses abroad, which frequently makes the patient give up treatment. Secondly, since the review process takes months in general, treatment could be delayed until the review process is completed. Not being treated at the right time would cause negative health outcomes to patients. Thirdly, the Government subsidy program focuses on the patients who are more likely to be cured. Therefore, patients with metastatic cancer who have a less chance for curing through radiotherapy are more likely to be rejected by the overseas treatment committee. Even though radiation therapy can be used to mitigate pain for patients with terminal stage of cancer, this palliative care is not covered by the current system.

Rising demand for services for cancer patients has been recognised by the Government of Fiji as a national health priority. Increasing attention has been paid to the lack of radiation therapy or radiotherapy both in Fiji and other Pacific countries. In line with it, the Ministry of Health and Medical Service (MoHMS) has been considering an establishment of a radiation oncology center in Fiji.

This study aims to estimate and compare the costs and benefits of introducing radiation oncology services in Fiji from the societal perspective, which takes all relevant cost and benefit into account, regardless of being public or private. Furthermore, we discuss potential impacts of introducing a radiation oncology center on the health system of Fiji.

2. Methods

Time horizon for the cost-benefit analysis (CBA) was 15 years from 2021 to 2035 as the life of radiotherapy equipment is 15 years. The inflation rate was applied to all types of costs and benefits; for land acquisition and building construction, GDP deflator (3.2%) was applied, and for the rest, 2.8% of consumer price index (CPI) was applied. Study results were converted to the present values of the year of 2016. The societal perspective[1] was taken considering direct/indirect medical costs, non-medical costs, such as travel costs, productive loss (life-year lost) and including the costs from the Government and individuals (Table 1).

All the epidemiologic characteristics for cancer were obtained from the Statistics Bureau of Fiji as well as GLOBOCAN 2012 provided by the International Agency for Research on Cancer (IARC). Estimates for the CBA model were taken from previous studies and expert opinions obtained from field visits to Fiji in January 2016. Due to the lack of accurate data (e.g., stages of cancer by type, age, and sex, etc.), many of the parameters in the analyses were estimated values under various assumptions. In order to reduce uncertainties, a conservative assumption was applied as a base-case scenario; sensitivity analyses with changing assumptions were also undertaken.

[1] "The perspective in CBA is a very broad one as it embraces the effects on everyone in society. A social evaluation does not consider just the parties directly involved with an intervention, that is the firms (the hospitals and the physicians) and the consumers (the patients as clients). It also covers those indirectly affected, including the family members of the patients and even the general taxpayer (Brent, R. J. Cost-Benefit Analysis and Health Care Evaluations, Edward Elgar Publishing. 2014: p.12)".