

# Does Financial Toxicity Exist Amongst Adult Cancer Survivors Treated with Curative-Intent Radiotherapy? A Pilot Study from Singapore

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## Research

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# Abstract

## Background

Cancer survivors may experience financial toxicity (FT) arising from diagnosis, treatment, and potential employment loss. The prevalence of FT in the context of Singapore healthcare model is unknown. We investigate if higher out of pocket (OOP) expenditure correlates positively with FT, and if higher FT correlates with a worse quality of life (QoL).

## Methods

In this pilot study, a cross-sectional survey was administered to survivors of nasopharyngeal or breast cancer, at National University Hospital Singapore. Patients' FT and QoL were measured using the Comprehensive Score on financial Toxicity (COST) and Functional Assessment of Cancer Therapy: General (FACT-G). Two multivariate regression models estimated (i) the association between FT and a range of variables and (ii) FT and QoL.

## Results

63% of our cohort of 76 patients experienced mild-moderate FT. Overall, the mean COST and FACT-G scores are 18.0 (out of 44) and 68.3 (out of 108), respectively. There was a positive correlation between COST and FACT-G scores ( $r = 0.45$ ). We did not find any significant association between OOP and FT. Predictors for FT included government-subsidized housing, lower education levels, hiring a formal caregiver, and the need for household members to take on extra employment.

## Conclusion

Greater FT correlates with a decline in QoL. Lower socio-economic patients are at higher risk of FT. OOP was not directly related to FT, likely in view of the effective means-tested subsidies. Additional resources should be considered for this at-risk population. Based on our pilot study, our methodology to quantify FT and OOP can be scaled up to other cancer primaries.

## Introduction

Financial impact of cancer diagnosis can be significant. Compared to non-cancer control groups, cancer patients are more likely to experience financial toxicity (FT). FT in oncology practice can be defined as the "detrimental effects of the excess financial strain caused by the diagnosis of cancer on the well-being of patients, their families and society" [1]. Based on studies carried out in Western countries, the prevalence of FT amongst cancer patients is reported to range between 30 to 50% [2].

The extent of FT depends on many factors, including costly treatment-related expenditures, loss of productivity or employment, and consequently loss of access to insurance schemes provided by the employer. The impact of FT has also been studied and is increasingly recognized to adversely affect quality of life (QoL) [3].

It is however important to note that the payment schemes utilized in Western countries and Singapore differ tremendously. Most patients in Western countries rely on social or private insurance for direct medical cost payments. Contrastingly, Singapore has a unique health-care model, with emphasis on co-payment and greater self-responsibility. In addition, we have government-instituted mechanisms in place to assist the under-privileged to access necessary medical treatments. For the above reasons, it is important to study the prevalence and magnitude of FT differing within Singapore.

In Singapore, citizens or permanent residents rely on their personal savings and typically have three additional sources of funding to pay for their medical bills. These three sources are known as MediSave, MediShield and Medifund [4]. MediSave is a national compulsory medical savings policy which working Singapore residents contribute part of their income to an account for their future use in approved medical expenses [5]. MediShield Life is a government-administered universal basic health insurance plan for Singapore residents that helps to pay for large hospital bills and selected costly outpatient treatments such as chemotherapy and radiotherapy [6]. This insurance plan permits patients to make less out-of-pocket (OOP) payments using MediSave and/or cash. Individuals may optionally purchase additional private insurance plans to further reduce their OOP payment. Lastly, MediFund is an endowment fund provided by the government for citizens who face financial difficulties with their remaining bills after drawing on other means of payment including MediShield Life, MediSave and cash [7]. The amount of MediFund subsidy is determined by means-testing. Over and above these three sources, elderly Singapore Citizens (born before 1960) and selected government employees are eligible for generous government subsidies which defray OOP further with Pioneer Generation Package (PG) and Civil Service Card (CSC) respectively.

With the unique medical payment schemes in place, findings in Western countries may not be applicable in our setting. We have thus designed this pilot study to provide preliminary data on the prevalence and magnitude of FT, as well as the correlation of FT with QoL in our local patients.

## **Methodology**

This pilot study took place in National University Hospital (NUH) and was approved by institution ethics review board. Our eligibility criteria include patients with non-metastatic breast cancer or nasopharyngeal cancer (NPC) who have completed curative intent radiotherapy, age range of 21 to 85 and must be disease-free during the 9-24 months post diagnosis. We have chosen these two cancer types as they usually affect middle-aged adults, who are likely to be employed and have other financial commitments such as housing loan and young family to support. They are also more likely to be susceptible to the impacts of FT. We used validated COmprehensive Score for financial Toxicity (COST) [8] and Functional

Assessment of Cancer Therapy – General (FACT-G) questionnaires [9] and permission from the FACIT was obtained to modify the recall period of both questionnaires from 7 days to 9–24 months. The lower time point of this period was chosen to avoid acute treatment-related adverse effects from influencing QoL and upper time point was to reduce recall bias.

Eligible patients were first sent postal correspondence and contacted via telephone a week later. Verbal consent was obtained for participation in the study and study participants were given the option to complete the enclosed questionnaires and return them via mail or have the survey administered over the telephone. Greater details of this process are described in Supplementary A.

We hypothesise that higher out of pocket (OOP) expenditure correlates positively with FT, and higher FT correlates with a worse QoL. Description of how OOP expenditure is obtained is also in Supplementary A.

### Statistical and Regression Analysis

Statistical analysis was performed using STATA 16. Differences in means between groups were compared using an independent-samples t-test. Categorical or ordinal variables were analysed using the chi-square test. Statistical significance was defined by a P-value of <0.05. Selected variables were cross-tabulated to explore the relationship between them.

We specified two regression models corresponding to the two primary variables of interest. The first model examines the association of covariates in Table 1 with the COST score, which measures financial toxicity:

$$\text{COST score} = \alpha_0 + \alpha_1 \text{ Cancer Site} + \alpha_2 \text{ Treatment} + \alpha_3 \text{ Socio-demographics} + \alpha_4 \text{ Direct Medical Costs} + \alpha_5 \text{ Direct non-medical Costs} + \alpha_6 \text{ Indirect Costs} + \alpha_7 \text{ Household Finances} + \alpha_8 \text{ Living Arrangement} + \alpha_9 \text{ Medical Bill} + u_1 \quad (1)$$

The second model examines the association of financial toxicity and other covariates with the FACT-G score which measures QOL:

$$\text{FACT-G score} = \beta_0 + \delta \text{ COST score} + \beta_1 \text{ Cancer Site} + \beta_2 \text{ Treatment} + \beta_3 \text{ Socio-demographics} + \beta_4 \text{ Direct Medical Costs} + \beta_5 \text{ Direct non-medical Costs} + \beta_6 \text{ Indirect Costs} + \beta_7 \text{ Household Finances} + \beta_8 \text{ Living Arrangement} + \beta_9 \text{ Medical Bill} + u_2 \quad (2)$$

The intercept terms are denoted by  $\alpha_0$  and  $\beta_0$  and represent the average COST and FACT-G score respectively holding other factors constant. The coefficients for the vector of covariates are denoted by  $\alpha_k$  and  $\beta_k$ , and the stochastic error terms are  $u_k$ . The coefficient  $\delta$  in Model 2, which measures the association between the COST and FACT-G scores, is also a coefficient of interest as it demonstrates the correlation between financial toxicity and QOL. Regression analysis on the medical bill variables only applied to the subset of respondents for which the data is available.

# Results

## Descriptive statistics

Of the 483 eligible patients, 389 (81%) and 94 (19%) had breast cancer and NPC, respectively. Detailed sample characteristics and their relevant statistical tests are presented in Table 1. Statistical tests indicate significant differences between survey participants ( $n = 76$ ) and non-participants ( $n = 407$ , either uncontacted or contacted but did not participate in the survey) for the cancer site, gender, and race ( $P = 0.000$ ). These differences are expected and directly attributed to our intention to sample similar proportions of breast cancer and NPC patients. Patients who had been involved in a clinical trial were more likely to participate in our survey ( $P < 0.01$ ). We also compared survey participants whose medical bill data were extracted for further analysis ( $n = 41$ ) to those who did not provide consent for us to do so ( $n = 35$  either refused or no response). There were no statistically significant differences between these two groups except that there were more patients from the Malay ethnicity in the former group ( $P < 0.01$ , results not shown).

Characteristics of our 76 survey participants are depicted in Table 2. Most respondents are married (76%), attained secondary and below education (63%), and live in a public Housing Development Board (HDB) flat (90%). For medical expenses, around 10% of the respondents qualify for MediFund, which provides further financial assistance based on means-testing. Another 10% received PG and CSC subsidies. About one-fifth of the respondents reported using their family's Medisave to pay for treatment.

Direct non-medical expenses include transport cost, use of Complementary and Alternative Medicine (CAM), and hiring a formal caregiver. Most respondents took public transport (66%), followed by taxi/private hire (25%) and private car (25%), some respondents selected more than one mode of transport in the questionnaire. The use of complementary and alternative medicine (CAM) was not prevalent. For the 31 (41%) respondents who used CAM, 11 (31%) of them stopped due to the cancer treatment. The reasons include CAM being not suitable, not effective, finances and others. Only six (8%) respondents hired a formal caregiver after their cancer diagnosis.

Respondents making adjustments to their living arrangement as a result of their cancer diagnosis are in the minority (18, or 24%). They cited financial reasons or to improve access to care. Some respondents have rented out rooms or moved to a smaller flat to raise funds, and some have moved in with family or friends to receive care. Seven (9%) respondents indicated that they or their household member(s) took on loans, including borrowing money from relatives and friends, to finance the cost of cancer treatment. Four borrowed less than \$10,000, one borrowed \$20,000 to \$30,000, and one borrowed \$50,000 and above.

The mean COST and FACT-G scores among the survey participants were 18.0 (out of 44) and 68.3 (out of 108), respectively. Higher scores indicate better feelings of financial wellbeing and better QOL respectively. The mean scores, as well as distribution of COST scores, were not significantly different between the breast cancer and NPC cancer patients (Table 3). For our sample, the two scores are positively and moderately correlated ( $r = 0.45$ ).

## **Cross-tabulations**

To gain a deeper insight into employment status and income for both the patient and household, we cross-tabulated the survey results for these two variables. Indirect costs of cancer include lost economic productivity for the patients and their household members. Only a quarter of the respondents who earned less than \$1,000 per month before cancer diagnosis reported being affected by changes in employment status or income compared to respondents (Table 4A). One reason is that these respondents were typically homemakers, retirees or have been out of the workforce for a significant period. In contrast, about 70% of the respondents who had higher earnings experienced an adverse impact on employment and income.

Around 60% of the respondents reported no change in the employment status of their household members (Table 4B). Accordingly, most of these respondents did not experience a fall in household income. For the affected households, most had employed household members taking on extra work or unemployed members seeking employment to supplement the income, while a minority had employed household members seeking alternative work arrangements (such as taking unpaid leave from work, working fewer hours, resigning from job, and/or early retirement) to devote more time towards caregiving. The reduction in household income ranged from \$250 to \$4,000 per month.

## **Medical Bill**

All 41 patients, for whom medical bill data were retrieved, incurred out-of-pocket expenses. Table 5 reports the average and median OOP expenses, alongside standard deviation (SD) and interquartile range (IQR), for inpatient and outpatient settings as well as both combined. There was no significant difference between the total average OOP expense between breast cancer and NPC patients (average \$26,818 vs \$24,206 respectively). The outpatient component ranged between 26 – 34% of the total costs. However, the average total OOP expense was skewed by five breast cancer patients with extremely high OOP (Supplementary Figure 1). Comparing the median total OOP costs, there was a significant difference between breast cancer and NPC (\$15,910 vs \$21,593,  $P=0.008$ ).

## **Regression Results**

### **Financial Toxicity**

For the first set of regression analysis, COST score is the dependent variable and the sample consists of 76 survey participants without medical bill data. The results are reported in Supplementary Table B. Specification 1 contains all the variables listed in Equation 1, except that due to the low utilisation of CAM and the possibility of recall bias for the transport mode used for hospital visit, these two variables were not included. Based on the adjusted R-squared, its explanatory power is relatively lower compared to Specification 2, which was obtained after systematically dropping the variables with coefficients that were small in magnitude or highly insignificant.

According to the parsimonious specification, patients who live in HDB flats were still found to have significantly lower scores (-8.3,  $P = 0.02$ ), with education level being marginally significant (-4.4,  $P = 0.06$ ). Patients who hired formal caregiver due to the cancer diagnosis, as well as those whose household member(s) needed to earn extra income to finance medical expenses were found to be associated with significantly lower scores (-7 and -6 respectively,  $P = 0.05$ ). On the contrary, patients requiring inpatient admission had significantly higher scores (4,  $P = 0.05$ ), symbolising increased feelings of financial well-being.

The second set of regression analysis also has COST score as the dependent variable, but includes the total OOP expense as an additional variable, for which data is limited to a subset of 36 survey participants excluding five outliers (Supplementary Table C). We did not find any meaningful correlation between OOP expense and FT for both the ordinary least squares (OLS) and two-stage least squares (2SLS) specifications.

### **Quality of Life**

Results of the pre-planned regression analysis with FACT-G score as the dependent variable are reported in Supplementary Table D. We found that the feeling of financial well-being is positively and significantly correlated with a patient's quality of life, controlling for other factors. Particularly, a one-point increase in COST score is associated with a 0.7 increase in FACT-G score ( $P = 0.002$ ). A loss of quality of life was found to be significantly associated with certain adverse changes that his/her household member(s) experienced, such as when household member(s) had to work more to supplement household income (-15.2,  $P = 0.02$ ) or when a household member's Medisave account is being used to pay for medical expenses (-0.3,  $P = 0.04$ ). Patients of Malay and Indian ethnicity are more likely to report higher quality of life.

## **Discussion**

FT is often an overlooked subject in cancer care and survivorship. The prevalence and impact of FT may vary amongst health care systems, depending on models of care. Singapore is unique, as it emphasises on shared-responsibilities and has a co-payment model and means-tests health care subsidises. The prevalence of FT within Singapore is unclear, and is possibly higher than countries with universal healthcare. Knowledge about FT (and the predictors associated with FT) will provide valuable information to administrators and health care providers to improve health care policies and redirect resources.

Within the Singapore context, Chan et al have qualitatively reported the affordability of cancer treatment amongst patients > 50 years. They found that patients undergoing targeted therapy were 2.5 times more likely to have difficulty paying for treatment. However, about 70% of the cohort felt that the existing financial schemes were helpful to reduce OOP costs [12]. To the best of our knowledge, we are the first to systematically assess and report on the prevalence of FT amongst Singaporean cancer survivors, using the widely utilised COST tool.

We found that the mean COST score to be 18.0 (out of 44) in our surveyed patients. This is 3–4 points lower than cohorts from the USA (indicating more financial toxicity). For example, De Souza et al. validated the COST tool in 233 North American patients with Stage IV solid tumour, who had been receiving palliative chemotherapy for at least 2 months. They reported a mean COST score of  $22.2 \pm 11.9$  [8]. Huntington et al. reported on the FT in 100 patients with multiple myeloma receiving systemic therapy in a tertiary academic centre in the USA. The mean COST score was 23 (SD 11.1), and they found a third of patients applying for financial assistance [13]. Within the Asian context, Honda et al. reported FT in a cohort of 156 Japanese patients, receiving chemotherapy for solid tumors. They reported a median COST score of 21 [14]. The differences in COST scores seen in our cohort are unclear. One possible explanation is the higher proportion of co-payments required within our health system, compared to USA and Japan.

Factors associated with a lower socioeconomic status – such as residence in subsidized housing and lower educational levels were understandably associated with a higher COST score. This is suggestive that vulnerable patients still experience FT despite available subsidies. In our study, a third of household members had to take on additional employment to supplement income, and this may directly affect the amount of care and help received by the patient from these working family members.

One surprising finding from our regression analysis, is that patient who spent part of their treatment requiring hospitalised care, had lower COST scores (signifying increased financial well-being). This is contrary to findings by De Souza et al. where more than 3 hospital admissions were associated with a worse COST score [8]. We postulate that this may be due to patients' access to specific subsidies and insurance coverage which were made available during and after hospitalisation. Certain private medical insurance policies extend the coverage of outpatient treatment costs for up to three months post hospitalisation. This benefit alleviates costs which would have otherwise been borne by the patient.

With regard to QoL, we corroborated the finding similar to other studies [15, 16], that a higher COST score (reduced FT) is positively correlated with a better QoL (improved FACT-G score) ( $P = 0.002$ ). Another interesting finding based on our regression model is that the patient's QoL suffered when their household members had to engage in additional employment to sustain their finances, or if the household members Medisave had to be utilised for the patient's medical expenses. The decline in QoL may arise from the negative emotions surrounding the excess financial strain on the family.

The financial impact of a cancer diagnosis is significant. The average OOP cost in our cohort is about \$25,000 which is more than five times the national median gross monthly income of \$4534 in 2020 [17]. We found that about half of our patients reported a change in their employment and income status after their diagnosis. About a third of the household members had to take on extra employment to supplement income. Despite this, half of them still reported a decrease in household income.

We could not find an association between OOP and FT based on our cohort. While this could be partially attributable to our small sample size with available billing data, another explanation could be due to the effectiveness of the means-tested subsidies, which permitted the most vulnerable patients to get the most financial assistance.

The main strengths of our study are that we successfully applied the COST tool in our population, to assess FT. In the process, we also translated the COST tool to the Chinese and Malay languages via a stipulated procedure defined by FACIT (the copyright holder of the COST questionnaire). We are the first to report on FT in adult cancer survivors with breast and nasopharyngeal cancer who have undergone curative treatment within the Singapore healthcare system. Although patients may feel uneasy talking about their financial situation, we managed to obtain out-of-pocket payment costs from approximately 50% of eligible patients.

With regard to study limitations, we acknowledge the potential recall bias – as patients were made to reflect on their treatment expenses and quality of life 1–2 years after completion of treatment. Secondly, there is a possibility of selection bias – patients in an extreme financial situation may have declined treatment entirely, and therefore not included in our study. Thirdly, the treatment for both breast cancer and NPC is typically multi-modal. Treatment of breast cancer involves surgery followed by a combination of chemotherapy, radiotherapy, targeted therapy and endocrine therapy while treatment of NPC typically involves radiotherapy with or without concurrent chemotherapy. It remains unclear which aspect of the treatment contributes more to FT. Certainly, some treatments like targeted therapy (with monoclonal antibodies) can be costly and contribute more to FT. However, we must acknowledge that the patient's treatment should be considered as an entirety.

## Conclusion

Some degree of FT exists within our population, with lower socio-economic patients being at higher risk. FT should not be considered in isolation, as it correlates with poorer QoL. OOP was surprisingly not directly related to FT, likely due to the presence of effective means-tested subsidies. Lastly, cancer diagnosis and treatment have an impact on patients' household members and additional resources should be devoted to reduce this burden for patients at risk. Looking ahead, our methodology can be scaled up to study FT in other cancer primaries. We would suggest collecting information (COST, QoL data) prospectively to eliminate the risk of recall bias.

## Declarations

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### Conflicts of Interest

All authors declare no conflicts of interest

## Ethics Approval

The questionnaire and methodology for this study was approved by the Human Research Ethics committee of National Healthcare Group. Domain Specific Review Board (DSRB) reference number: 2018/00963

## Consent for Publication

Participants gave verbal consent prior to participation in our study. Data has been de-identified by trusted third party.

## Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

## Authors' contribution

NWI, BV, YKH, BG made substantial contribution to the conception and design of the study, or acquisition of data or analysis, interpretation of data, drafted and revised the manuscript, MT made substantial contribution to acquisition of data, TCC, YCM, TCSJ, HCHF, SYY, YSJ made substantial contribution to the conception and design of the study and revised our draft critically for important intellectual content.

All authors read and approved the final manuscript for submission.

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## References

1. Desai A, Gyawali B. Financial toxicity of cancer treatment: Moving the discussion from acknowledgement of the problem to identifying solutions. *EClinicalMedicine*. 2020;20:100269.
2. Gordon L, Merollini K, Lowe A, Chan R. A Systematic Review of Financial Toxicity Among Cancer Survivors: We Can't Pay the Co-Pay. *The Patient - Patient-Centered Outcomes Research*. 2016;10(3):295–309.
3. Chino F, Peppercorn J, Taylor D, Lu Y, Samsa G, Abernethy A. **et al**. Self-Reported Financial Burden and Satisfaction With Care Among Patients With Cancer. *Oncologist*. 2014;19(4):414–20.
4. **MOH | Healthcare Schemes & Subsidies [Internet]. Moh.gov.sg. 2021 [cited 1 February 2021]. Available from:** <http://moh.gov.sg/cost-financing/healthcare-schemes-subsidies>.
5. **Medisave [Internet]. 2021 [cited 1 February 2021]. Available from:** <https://www.cpf.gov.sg/Members/Schemes/schemes/healthcare/medisave>.

6. **MOH | MediShield. Life [Internet]. Moh.gov.sg. 2021 [cited 1 February 2021]. Available from:** <https://www.moh.gov.sg/cost-financing/healthcare-schemes-subsidies/medishield-life>.
7. **MOH | MediFund [Internet]. Moh.gov.sg. 2021 [cited 1 February 2021]. Available from:** <https://www.moh.gov.sg/cost-financing/healthcare-schemes-subsidies/medifund>.
8. **Pioneer Generation Package [Internet]. Pioneers.gov.sg. 2021 [cited 1 February 2021]. Available from:** <https://www.pioneers.gov.sg/en-sg/Pages/Home.aspx>.
9. **de Souza J, Yap B, Wroblewski K, Blinder V, Araújo F, Hlubocky F et al.** Measuring financial toxicity as a clinically relevant patient-reported outcome: The validation of the COmprehensive Score for financial Toxicity (COST). *Cancer*. 2016;123(3):476–84.
10. **Cella D, Tulsky D, Gray G, Sarafian B, Linn E, Bonomi A. et al.** The Functional Assessment of Cancer Therapy scale: development and validation of the general measure. *J Clin Oncol*. 1993;11(3):570–9.
11. **De Souza J, Aschebrook-Kilfoy B, Grogan R, Yap B, Daugherty C, Cella D.** Grading financial toxicity based upon its impact on health-related quality of life (HRQol). *J Clin Oncol*. 2016;34(3\_suppl):16–6.
12. **Chan A, Chiang Y, Low X, Yap K, Ng R.** Affordability of cancer treatment for aging cancer patients in Singapore: an analysis of health, lifestyle, and financial burden. *Support Care Cancer*. 2013;21(12):3509–17.
13. **Huntington S, Weiss B, Vogl D, Cohen A, Garfall A, Mangan P. et al.** Financial toxicity in insured patients with multiple myeloma: a cross-sectional pilot study. *The Lancet Haematology*. 2015;2(10):e408–16.
14. **Honda K, Gyawali B, Ando M, Kumanishi R, Kato K, Sugiyama K. et al. Prospective Survey of Financial Toxicity Measured by the Comprehensive Score for Financial Toxicity in Japanese Patients With Cancer.** *Journal of Global Oncology*. 2019;(5):1–8.
15. **Fenn K, Evans S, McCorkle R, DiGiovanna M, Puzstai L, Sanft T. et al.** Impact of Financial Burden of Cancer on Survivors' Quality of Life. *Journal of Oncology Practice*. 2014;10(5):332–8.
16. **Kale H, Carroll N.** Self-reported financial burden of cancer care and its effect on physical and mental health-related quality of life among US cancer survivors. *Cancer*. 2016;122(8):283–9.
17. **Gross Monthly Income From Work [Internet]. 2021 [cited 1 February 2021]. Available from:** <https://stats.mom.gov.sg/Pages/Income-Summary-Table.aspx>.

## Tables

Table 1: Survey sample characteristics, participants versus non-participants

	Eligible Patients (n = 483)		
	Non-participants (n=407)	Survey participants (n=76)	Test Statistic
<b>MEDICAL CONDITION</b>			
Cancer primary			
Breast	342 (84%)	47 (62%)	P = 0.000
Nasopharyngeal	65 (16%)	29 (38%)	
ECOG Performance Status: 0 to 1	401 (99%)	74 (97%)	P = 0.349
<b>SOCIO-DEMOGRAPHICS</b>			
Gender			
Female	360 (88%)	50 (66%)	P = 0.000
Male	47 (12%)	26 (34%)	
Ethnicity			
Chinese	338 (83%)	45 (59%)	P = 0.000
Indian	20 (5%)	3 (4%)	
Malay	41 (10%)	23 (30%)	
Others	8(2%)	5 (7%)	
Age			
Mean	58	60	P = 0.139
Below 50	82 (20%)	14 (18%)	
50-59	123 (30%)	13 (17%)	
60-69	143 (35%)	39 (51%)	
70 & above	59 (15%)	10 (13%)	
Citizenship			
Singapore Citizen	359 (88%)	68 (90%)	P = 0.827
Singapore Permanent Resident	438 (9%)	7 (9%)	
Other nationality	10 (3%)	1 (1%)	
<b>MEDICAL EXPENDITURE RELATED</b>			
Subsidy class			

Subsidy	316 (77.6%)	66 (86.8%)	P = 0.164
Subsidy for PR	35 (8.6%)	5 (6.6%)	
Private	56 (13.8%)	5 (6.6%)	
Participating in a clinical trial	26 (6%)	15 (20%)	P = 0.000
Warded	108 (27%)	29 (38%)	P = 0.039
Mean no. of admissions (if warded)	1.5	1.7	P = 0.302
Mean total days of stay (if warded)	7.5	9.2	P = 0.221
TREATMENT			
Chemotherapy	247 (61%)	53 (70%)	P = 0.136
Hormonal treatment for breast cancer	263 (77%)	37 (79%)	P = 0.780
Targeted therapy for breast cancer	44 (13%)	7 (15%)	P = 0.699

Table 2: Survey Participants

Variables	n = 76
SOCIO-DEMOGRAPHICS	
Marital Status	
Single	6 (8%)
Married	58 (76%)
Divorced/separated	7 (9%)
Widowed	5 (7%)
Education	
Secondary and below	48 (63%)
Above secondary	28 (37%)
Residential Type	
HDB <sup>†</sup> 1 & 2-room flat	7 (9.33%)
HDB 3-room flat	12 (16%)
HDB 4-room flat	28 (37.33%)
HDB 5-room flat	21 (28%)
Private residence	7 (9.33%)
DIRECT MEDICAL EXPENSES	
Subsidies	
MediFund	7 (9%)
CSC <sup>‡</sup> or PG <sup>‡</sup> card holder	9 (11%)
Patient used family member's MediSave to pay for cancer treatment	16 (21%)
DIRECT NON-MEDICAL EXPENSES	
Transport to hospital <sup>^</sup>	
Public transport	50 (66%)
Taxi/Private Hire	19 (25%)
Car	19 (25%)
Complementary and alternative medicine (CAM)	
CAM user (former or current)	31 (41%)
Stopped using CAM due to cancer treatment	11 (35%)

Because the medicine or service was not suitable	4
Because the medicine or service was not effective	1
Because of finances	3
Because of other reasons	3
Formal caregiver	
Hired formal caregiver due to cancer diagnosis	6 (8%)
HOUSEHOLD FINANCES AND LIVING ARRANGEMENT	
Had to make adjustment to living arrangement	18 (24%)
For financial reasons	11
To receive care	8
Took loan (including borrowing money from relatives and friends)	7 (9%)

<sup>^</sup> Percentages do not sum up to 100% as some respondents selected more than one transport mode.

<sup>†</sup> Housing Development Board

<sup>‡</sup> Civil service card (CSC); Pioneer Generation (PG)

Table 3: Test Scores

Variables	All Patients (n = 76)	Breast (n = 47)	NPC (n = 29)	Test Statistic, P-value
COST Score <sup>1</sup>				
Mean (SD)	18.0 (9.7)	17.7 (9.5)	18.5 (10.0)	0.71
Median	18	18	18	
25 <sup>th</sup> percentile	10	9.5	11	
75 <sup>th</sup> percentile	25.3	24	26	
<i>Distribution of scores</i>				
Mild: ≥ 26	19 (25%)	11 (24%)	8 (28%)	0.86
Moderate: ≥ 14 – 26	29 (38%)	19 (40%)	10 (34%)	
Severe: 0 – 14	28 (37%)	17 (36%)	11 (38%)	
FACT-G Score <sup>2</sup>				
Mean (SD)	68.3 (20.7)	69.7 (19.6)	66.2 (22.5)	0.48
Median	74	76	68.3	
25 <sup>th</sup> percentile	55	60.9	48	
75 <sup>th</sup> percentile	82.5	80.9	88	
Correlation between COST and FACT-G scores	0.45 (P = 0.0001)	0.41 (P = 0.0047)	0.51 (P = 0.0044)	

1. Measures financial toxicity out of a maximum score of 44. The higher the score, the better the feelings of financial wellbeing and the lower the financial toxicity.
2. Measures quality of life out of a maximum score of 108. The higher the score, the better the quality of life

Table 4A: Change in employment and income due to cancer treatment, by income category

	Gross Monthly Income				Total no. of respondents
	Below \$1,000	\$1,000 - \$4,999	\$5,000 & above	Do not know or no response	
Income before cancer diagnosis	24	27	9	16	76
Employment and income status after cancer diagnosis					
Affected	6	18	8	9	41
No change	18	9	1	7	35

Table 4B: Effect of cancer on the patient's household members

Change in employment situation	No. of respondents	Change in household income			
		No Change	Increased	Decreased	Do not know or missing response
No change	44 (58%)	35	0	6	3
Worked more to supplement income	27 (35%)	6	0	14	7
Worked less due to caregiving	5 (7%)	1	1	1	2
Total	76 (100%)	42 (55%)	1 (1%)	21 (28%)	12 (16%)

Table 5: Out-of-Pocket Expenses

	Breast (n = 30)	NPC (n = 11)	Test statistic, p value
Average (SD)			
Inpatient	19,777 (25,804)	15,923 (4,934)	0.63
Outpatient	7,041 (7,165)	8,283 (6,145)	0.61
Total	26,818 (31,147)	24,206 (9,191)	0.79
Median (IQR)			
Inpatient	10,523 (11,539)	16,007 (6,187)	0.09
Outpatient	4,950 (5,711)	6,291 (8,625)	0.32
Total	15,910 (17,013)	21,593 (16,013)	0.008

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [SupplementaryA.docx](#)
- [SupplementaryFigure1.docx](#)
- [SupplementaryTableA.docx](#)
- [SupplementaryTableB.docx](#)
- [SupplementaryTableC.docx](#)
- [SupplementaryTableD.docx](#)