
Health-care delivery and cancer care systems: Economics and a market perspective of the cancer care spectrum

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Abstract The purpose of this study is to evaluate and classify the economic market structure of cancer care in the United States, across the spectrum of cancer care. The author reviewed current published reports regarding demand, growth and costs of cancer care and oncological health service. The market structure for several product lines in the oncological services industry were compared against currently established economic models. A structural approach, based on economic theory, was used to evaluate the various market structures involved in the continuum of cancer care products. An overview of healthcare markets is described. In general, at a national level, cancer care follows a monopolistic competition market, where each centre competes with cancer centres, hospitals, outpatient facilities and health organisations that meet the cancer care needs. Specialised cancer centres also fall into a unique category for research and survivorship programmes, forming a natural monopoly. Healthcare organisations that provide all forms of cancer care services need to be able to adapt to meet the need of each market position.

KEYWORDS: healthcare market structure, oncology care, cancer care delivery, health economics

INTRODUCTION

Oncological services are growing rapidly in the United States.¹ A study by the National Cancer Institute predicts that the incidence of cancer cases will rise by 55 per cent, while oncology-related visits will increase from 38 million in 2005 to 57 million in 2020.²

The cost of cancer care is an approximate estimate. Lyman³ predicted that the cost of cancer care would total US\$264bn (10 per cent of national healthcare costs) and continue to rise.⁴ In 2015, the direct medical cost of cancer alone was a staggering US\$80.2bn, as of 2015.⁵

The lower end of the overall economic cost range of cancer costs amounted to US\$125bn, in 2009⁶ Cancer care costs are unique, involving a myriad of indirect costs, such as formal and informal caregiver time, remission/recurrence, loss of worker productivity and radiation/chemotherapy-related side effects, such as cardiotoxicity.

The number of chemotherapy drugs approved by the US Food and Drug Administration (FDA) has increased. The recent increase in chronic conditions, the obesity epidemic, poor eating and exercise habits, smoking, environmental exposures and unexplained health disparities foreshadow an increasing need or demand for oncological care. Cancer-related visits have also continued to increase.⁷

Even cancer survivors are 'in need' of care provided at cancer care centres. The pool of cancer survivors has increased since 1971, with more than 12 million survivors.⁸ Cancer survivors result in an additional demand burden that exceeds the initial number of new cancer cases per year.⁹ Owing to new therapies and early detection opportunities, two-thirds of cancer patients survive longer than five years, fuelling more oncology visits. In fact, almost 70 per cent of oncology visits are one year post treatment.¹⁰

The demand for radiation treatment is projected to increase by 22 per cent from 2010 to 2020, owing to the ageing population and changes in population demographics; sensitivity analyses has shown that the utilisation of radiation therapy varies from 10 to 35 per cent, depending on the incidence of cancer and radiation treatment usage.¹¹ Using recent data, the American Society of Clinical Oncology projected that by 2020 there would be a 48 per cent increase in demand, followed by a capacity increase of only 14 per cent.¹² Surprisingly, the shortfall in the supply of oncologists is met with an absence of an increase in oncology fellowships.¹³ Oncologists are in short supply, and by 2020 an oncology workforce shortage will have developed, under the pressure of our ageing

population and the growing cancer survivor population.¹⁴

In this paper, cancer care centres will refer to all generalised healthcare organisations that provide cancer care in the health-care delivery system, including but not limited to, speciality hospitals, community hospitals, comprehensive cancer centres and paediatric hospitals. The factors that affect demand for cancer care at cancer care centres include the price of care, price of competitors' care, income, income distribution of the area, incidence of cancer, advertising, insurance status, range of services offered, patient needs, location and distance, population level risk and lifestyle, type of cancer, survivorship and previous experience with the facility. Age and health habit-related cancer cases will generate a new wave of cancer survivors.¹⁵

This review of literature aims to evaluate how cancer centres fit with the currently established healthcare market structure in the United States, for each market in the entire spectrum of cancer care services — prevention, cancer care, specific cancer care lines (rare cancers), cancer research and survivorship services.

OVERVIEW OF MARKET STRUCTURE MODELS PRESENT IN HEALTHCARE INDUSTRY

Currently, there are five major health economic models of market structure: perfect competition, monopoly, oligopoly, monopolistic competition and natural monopoly/public utility. Theoretically, the number of competitors and consumers/buyers is so large that no single party can influence the price of the good/service in perfect competition. The most notable feature of perfect competition is that the demand curve is horizontal, as marginal revenue equals marginal cost and price. In the healthcare system, pricing is not a strong market signal, services are differentiated and the unfettered competition does not

work for the healthcare market; this form of market structure is not applicable to healthcare services.¹⁶ Quality indicators can also be analysed as a perfect competition model. Nursing homes compete for quality indicators, not for pricing, as prices are not set by nursing homes.¹⁷ Overall, in the healthcare market, the 'right' kind of competition — where increased competition increases quality and reduces prices — is not fostered, and current competition will only continue to drive prices upwards.¹⁸

In a monopoly market structure, there is only one supplier with enormous market power. To keep prices at higher levels, small quantities of goods are sold. Monopolists practise price discrimination to maximise the producer surplus. Public utility market structure occurs when a monopoly provides care more efficiently than many other organisations providing the same service.

Price discrimination is one feature of market power in the insurance market.¹⁹ Monopolistic market schemes are common in the hospital/provider and speciality hospital sector. As mentioned previously, perfect competition market structure does not fit the current healthcare framework. Rather, insurers and providers are mainly in charge of setting prices, owing to inherent monopoly power. Monopolistic providers use their market power to negotiate with insurers for higher prices. On the other hand, insurers may contract with select providers, increasing prices in order to gain favoured contracts. Consolidated hospitals have greater market power than oligopolistic providers.²⁰ Hospital mergers drive prices even higher; the costs are pushed down to insurers, to employers and all the way down as higher premiums for patients.²¹ Speciality hospitals (especially those with satellite clinics and outreach services) exercise more market power.

An oligopoly occurs when a few companies sell a similar product. Oligopoly involves dynamic decision-making by a

few firms regarding market entry, exit, pricing and investments.²² The decisions of Hospital A will affect Hospital B, and in turn Hospital A, and so on. While hospitals form monopolies, insurers form oligopolies. Currently, 12 insurers have secured two-thirds of the market share of health insurance.²³ This 'insuragopoly' will be strengthened with the advent of insurance exchanges under health reform.²⁴ The health insurance market is and likely will continue to be highly concentrated.²⁵ In addition, concentrated areas of providers can form oligopolies, taking on a pricing strategy similar to insurers. A natural experiment on the merger of Aetna and Prudential insurance companies indicates that premiums increase in areas where market power is the strongest.²⁶ In addition, where there is higher market power, there is higher substitution towards lower-priced forms of labour.²⁷

The US healthcare system has also been characterised as monopolistic competition. This market structure, however, does not seem to function properly; market power and diversification lead to higher prices, expenditures and costs, resulting in productive/technical and allocative inefficiencies. Services are diversified, and consumers respond to the variety.²⁸ An analysis of Panel data (multiple observations of members, over long time frames) from 1998 to 2005 show that the healthcare insurance market is not highly competitive (perfect competition); insurer market power is used to negotiate premiums.²⁹

RELEVANT RESEARCH ON THE MARKET STRUCTURE OF CANCER CARE SERVICES

Cancer care services/products are usually considered to be a part of the domain of speciality hospitals, although there are many options for health-care delivery of cancer care services. When evaluating the structure of the cancer care markets, it is

important to first define the market that is being considered; in this case, it is the provider of cancer care. A product may be substitutable in the eyes of a patient, yet from the provider's perspective it may exist in two separate markets.³⁰ Identifying the market and the competitive firms involved is often dynamic.³¹ Services/products across the cancer care spectrum involve many markets and have a wider market span than only speciality hospitals or local/regional community hospitals, since some cancer patients will travel far and wide to access reputed facilities, while underserved cancer patients face disparities in the spectrum of care delivery. Thus, cancer care services/products within one organisation compete with local/regional hospitals, outpatient centres, speciality hospitals and cancer care centres, as well as local and regional community hospitals and comprehensive cancer centres nationwide. This paper will analyse whether regional, local and national level markets, as well as cancer treatment, cancer research and cancer survivorship services, fit the assumptions involved in currently established market structures.

PURE COMPETITION: CANCER SCREENING SERVICES

In non-healthcare markets, an example of pure competition is in the arena of agricultural markets. Pure competition is very rare, especially in healthcare.

Cancer screening services are the closest approximation to pure competition market structures among cancer care providers. In this case, cancer screening services are not limited to cancer care providers/centres; such cancer screening services are one aspect of the cancer care spectrum that can be offered by any healthcare provider, primary care or diagnostic imaging service. There are low barriers to entry — no limitations on who needs to provide services, which are often provided at the primary care level. Cancer screening is a relatively standardised

product, and there is a reduced level of differentiation among cancer care and healthcare providers. Owing to the inherent competition in cancer screening services, the prices of these cancer care services are driven down, as determined by consumer demand for these services. In turn, consumer demand for cancer screening services is also driven by insurance coverage of preventive services, which reduces the patient's effective out-of-pocket price, increasing the demand for cancer screening. Suppliers of cancer screening become price takers, as providers of the cancer care services do not have control over prices given the competitive market structure for this cancer care product.

MONOPOLISTIC COMPETITION MARKET STRUCTURE: THE NATIONAL CANCER CARE MARKET

Health care, especially cancer care, is a reputation good. The reputation of each cancer centre is heightened by advertising regarding the quality of care available, expertise, brand, experience, research, dedication, location, patient satisfaction, survival rates, as well as patient-level personal ties and recommendations and other intangible aspects of cancer care. Owing to the prominence of each of the above issues, and the brand, many patients even travel from out of state to receive a higher standard of care.

This creates a national *monopolistic competition market structure* for cancer care, for *each type of healthcare organisation* providing cancer care (cancer care markets for speciality hospitals, community hospitals, oncologists in group practices, hospital systems, etc). Consumers benefit from the spectrum and variety of services offered by providers at different levels and care services. It is important to consider that some cancer care providers have a much larger market area than community hospitals, owing to the variety of care provided; patients may be willing to travel far to receive service

at one of these facilities and may therefore be competing for patients with cancer care services in other communities. Each cancer care centre must compete with the cancer care services offered by multiple other providers, and, unlike a pure competition structure, each provider faces a downward sloping demand curve. Thus, cancer care service providers become price makers, as patients benefit from differentiated cancer care products in the market. There is a small operating margin.³² Within this market structure, providers of cancer care services face low barriers to entry and exit. There is freedom to enter or exit, and providers of cancer care thus need to increase patient reach; for example by expanding satellite/affiliate centres/and outpatient clinics or increasing product lines — such as adolescent and young adult programmes, cancer screening location centres, online consulting for international patients and supportive care. There is clear human capital, distribution and marketing differentiation of each cancer care product within the nationwide markets for cancer care centres. Thus, newer cancer care competitors who begin to enter the market have high barriers to entry.

In addition, the nationwide cancer care (all forms of cancer and providers) market also follows a *monopolistic competitive market structure*. Thus, similar organisations that provide cancer care services have a small market share in comparison with the cancer care market, and an even smaller share in the entire *cancer care market, for all provider types*. This is defined as *the overall demand for cancer services*. There are many substitutes (small community hospitals for larger regional hospitals, speciality hospitals, paediatric care/centres, individual oncology practices, comprehensive cancer centres, etc), and thus the overall demand for cancer care nationwide is highly elastic. In fact, in 2002, 90 per cent of cancer care was provided in the community setting³³; each cancer care provider must compete against these settings. Each cancer serving healthcare centre has

no monopoly power over excellent and high-quality cancer care.³⁴ Thus, the demand curve for cancer care centres constantly shifts through disequilibrium; as soon as another or mainstream cancer care centre adapts a new FDA technology, competing community cancer care centres may quickly attempt to attract patients again.

NATIONAL CANCER CARE MARKET DEMAND

Using 2006 data on supply and demand of oncologist projections and cost of cancer care from the American Society of Clinical Oncology, a demand curve for cancer care was generated.

In general, the overall (market level) demand for cancer care is likely to be more inelastic. This illustrates that as the price of cancer care increases, the demand for cancer care services will not likely be affected, as the spectrum of cancer care services becomes an urgent necessity — unlike some medical services or elective care or luxury goods; although price does affect patient decisions, there are no equivalent substitutes for cancer care services. The demand for cancer care services from an individual hospital or cancer care organisation or oncologist, however, is likely to be elastic, as competition is higher and substitutes for cancer care are available. This is addressed further in the section regarding oligopoly market structures. The graph in Figure 1 indicates that the demand for oncology visits, for all types of cancer, is elastic. This demand curve represents the overall demand for cancer services, at an individual cancer hospital. During the initial stages of cancer treatment, the price/cost of cancer treatment is high, and the quantity of oncologist visits demanded is low.³⁵ The demand for oncologist visits gradually increases during the middle/continuing stages of treatment and the last 12 months of life, as the cost of treatment also decreases.³⁶ The market demand curve is less steep, almost horizontal, indicating that cancer

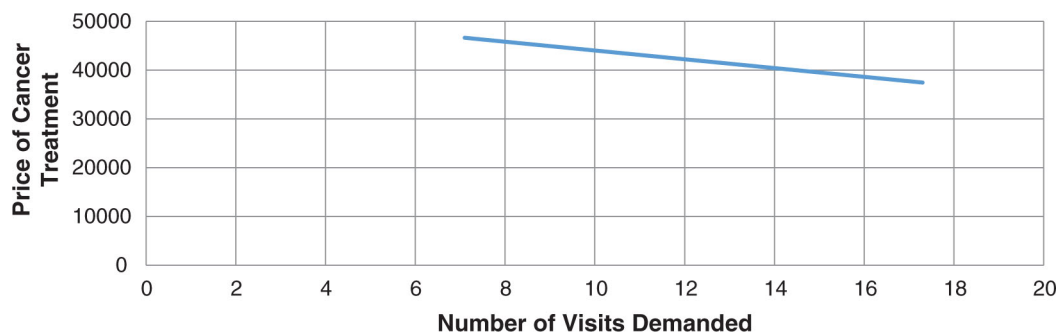


Figure 1: Demand curve for cancer care; as price of cancer care increases, demand for care is not affected, illustrating inelastic demand

care has a monopolistic competitive market structure (elastic demand). In addition, demand will increase in the next decade, and the demand curve D will continuously shift upwards, to D' , D'' , D''' , and so on, driven by changes in demographic factors.

Demand plays an important role in the market; in this case it represents the total amount of cancer care good that patients and survivors are willing to pay for at alternative prices. The direction of the demand curve (downward sloping) indicates that most of these markets do not follow a perfect competition (horizontal) or monopoly structure (steep curve/almost vertical).

OLIGOPOLY MARKET STRUCTURES: REGIONAL/LOCAL LEVEL MARKET, CANCER TREATMENT AND CANCER CARE FOR RARE CANCERS

Within geographically local and/or regional cancer care markets, cancer care centres function in an *oligopoly market structure*. Each cancer centre within the regional market attempts to maintain and/or expand its market share. Sunk costs and high research and development costs within each facility create deterrents to entry, for new, developing cancer care facilities or cancer centres designated by the National Cancer Institute. Specialised cancer centres emphasise a multitude of clinical trials, FDA-approved treatments and research

facilities; these cancer research resources are scarce and represent another barrier to entry — very large fixed costs.

Cancer centres can also be evaluated by product line, such as by cancer treatment type — colorectal cancer, thyroid cancer, hepatocellular carcinoma, melanoma, leukaemia or thymoma cancer care — or by broad definitions — rare cancers, cancer screening or cancer in children. Within product/service line markets, there is another *oligopoly market structure*; thus, given the example of rare cancer product lines, rare cancer care follows an oligopoly market structure across all cancer centres that service these cancer care needs. It is evident within the cancer market that there are no strong competitors in these specialised markets. Even cancer care drugs are not priced according to competitive market pressures,³⁷ as in an oligopoly.

These oligopolies seem to follow a price leadership model. Cancer is a life-threatening illness, and the demand curve becomes almost perfectly inelastic (ie vertical). Inherent moral hazard and adverse selection in insurance also partly contribute to creating a consumer demand for cancer care centres that seems to be mostly inelastic. Insurers will often deny coverage of high-priced chemotherapies or cancer providers out of the preferred network; yet some patients continue to take life-saving drugs or visit cancer centres out

of their network. In most cases, changes in effective price due to insurance coverage do not affect the demand for cancer care. Cancer centres can price their services on the basis of quality of care/reputation. Thus, owing to their cost structure and recognition, some cancer centre services, especially those specialising in rare cancer care needs, are able to lead the market in their pricing strategies. In view of the limited cancer care centres within each geographic area in the USA, there is a scramble to obtain market shares of cancer patients.

NATURAL MONOPOLY/PUBLIC UTILITY MARKET STRUCTURE: CANCER RESEARCH AND SURVIVORSHIP

Specialised cancer centres, such as in teaching hospitals, speciality hospitals, hospital systems or comprehensive cancer centres, can also function similarly to how hospitals and providers use their market power to create a *monopoly-based market structure*. This additional market power may prove to be efficient in some services, such as cancer research and survivorship services. These cancer centres are involved in developing new treatments, working on clinical trials and training oncologists. These functions of a specialised cancer centre form a public utility market structure, in that these specialised centres are more efficient at providing these cancer care services.

Specialised cancer centres commit a major portion of their time and effort to delivering new, safe, promising treatments and advanced diagnostic technologies. Owing to the initial sunk cost incurred in the development of new cancer therapies, the structure of the market for *new cancer therapies/cancer research* at specialised cancer centres takes on a *public utility market structure*. For example, the sunk costs of the initial investment in cancer support grants necessary for cancer treatment research, survivorship research or even the National Cancer Institute comprehensive

cancer centre designation act as a barrier to entry for many unspecialised healthcare organisations interested in undertaking cancer research or entering the specialised markets. In this case, cancer research for cancer care services should, theoretically, be more efficient when provided through a specialised cancer centre than through multiple organisations. These research services are characterised as public goods that need public intervention and support.

The public utility model is a form of monopoly. Ensuring that patients are able to afford these new therapies stipulates the need for government intervention. In addition, specialised cancer centres have a large flow of cancer patients; the advancement of therapeutic and chemotherapy drugs has increased the number of cancer survivors in recent years. Patient volume rates are higher at these specialised cancer care centres and attract patients from outside local/regional markets as well, improving the outlook towards survivorship cancer care services. These specialised cancer centres create an efficient way to provide survivorship support groups and services to consumers: economies of scale. The consumer group is easily accessible. Currently, emotional and physical complications in cancer survivors have not been adequately addressed.³⁸ These specialised cancer centres have the opportunity to use their public utility market structure and attract cancer survivors.

DISCUSSION: LIMITATIONS

Few papers have evaluated the market structure of a continuum of cancer care services at cancer centres. Information on market share of each cancer centre, across the spectrum of cancer care products, is usually unavailable or subjective. The only study that was conducted in regard to market share of cancer centres was one in France, which evaluated the French comprehensive cancer centre.³⁹ Very few papers have focused on the economics of cancer centres; most have

focused on cancer care in general. Thus, a limitation of this research is the extrapolation of issues in speciality hospital and healthcare models for cancer centres. Since there was a dearth of research on cancer centres available, a variety of resources were used to evaluate the market economics of cancer care; thus the validity of this research is dependent on the validity of the diverse sources used. Issues with market structure may be underestimated in cancer centres, owing to the large volume of patients and varying services. Very few studies have evaluated cancer screening, treatment and its relationship to market structure.

Limitations of this current research centre on projections of future demand for oncology care and elasticity. The elasticity of demand for cancer care services plays a major role in determining market structure. More studies have been conducted with reference to the supply of cancer care and the workforce. Several studies by researchers and the American Society of Clinical Oncology have projected the issues with supply.⁴⁰ On the basis of Surveillance, Epidemiology and End Results data for 1998–2002 and the American Medical Association Masterfile data on practising oncologists, cancer incidence and capacity for care have been forecasted.⁴¹ The base case value assumed no changes in care delivery and physician practices. The surveys used as data for the study had low response rates. The demand forecasting data — Surveillance, Epidemiology and End Results data from 1998 to 2002 — temporality did not match that of the supply data (2005–2006). The paper did not provide information about descriptive statistics, since the survey was conducted by e-mail, and sampling strategies appeared to be convenience sampling. It may be likely that women or younger age groups may have been under-sampled. The exact methodology used (ie Markov model, Monte Carlo analysis, bootstrapping, etc) to forecast supply, capacity and demand for cancer care were not specifically indicated.

CONCLUSION AND FUTURE RESEARCH

Since there are now more FDA-approved chemotherapy drugs and radiation therapy treatments for cancer patients, they are receiving more treatment in terms of chemotherapy infusions and inpatient and outpatient care. Advances in molecular biology of cancer allow for targeted cancer treatment, with increased effectiveness and increased cost.⁴² Innovative radiation therapy, such as the new proton therapy, precision in cancer detection/recurrence and several ongoing clinical trials, such as with rare forms and aggressive types of cancer, provide further options for cancer treatment for patients. Evaluating the market structure of cancer centre services is an important aspect of addressing the economic functioning and behaviour of cancer care services offered.

This study finds that cancer care centres follow several of the currently established market structure models. Since there are multiple types of cancer care markets within each cancer centre, the organisation needs to adapt to different market positions. On a regional/local level, cancer care centres compete in an oligopoly market, while in the research arena, cancer centres face monopolies and public utility models of market structure. The nationwide cancer care market takes on a monopolistic competitive market structure. Cancer care centres compete nationwide with similar types of cancer care providers' counterparts. In addition, each organisation itself has a small market share for cancer care, competing with all forms of cancer care providers. Many cancer centres also have diversified products, in order to meet the extent of demand, an important indicator of the monopolistic competitive market. This also explains the need for continuous cancer research innovation at specialised cancer centres. Some specialised cancer centres are able to gain a slight competitive advantage with the innovation of new therapies, followed by the adoption of these technologies. Other cancer care centres are

also able to leverage their reputation; this market strength allows them to compete with their counterparts.

Future research should include more evaluations of the relationships between different market structures and analyse supplier-induced demand; cancer care providers in monopolistically competitive markets may feel a need to induce demand to keep up with provider competition, as per the utility maximisation model. Specialised cancer care centres need to be further evaluated, especially comprehensive cancer centres. The 41 National Cancer Institute (NCI)-designated comprehensive cancer centres, as well as the 68 total NCI-designated cancer centres, in the United States are likely to face unique issues that would affect market structure, in addition to the economic aspects faced by any cancer centre/hospital. These comprehensive cancer centres represent a step above most cancer centres and provide quality cancer care and are required to provide training for cancer care professionals.

In addition, evaluation of specialised cancer centres and efficiency in survivorship services, through the incorporation of mid-level providers and nursing staff for follow-up care visits is an important direction for future research. In fact, most nurse practitioners and physician assistants are involved in follow-up care at cancer centres.⁴³ These researchers reported that the role of nurse practitioners (NPs)/physician assistants (PAs) in the oncology field, especially in specialised cancer care, such as in comprehensive cancer centres, is expanding, and that the mid-level providers have a significant impact on clinical care and productivity. One approach to incorporate mid-level practitioners, as well as nurses, into cancer centres is to focus on non-price-related advertising (oligopoly). Specialised cancer centres need to market the current efforts of the nursing staff and quality of care; many cancer centre websites do not include nursing expertise and specialisation.⁴⁴ There is paucity of information on the

scope of interdisciplinary cancer nursing and research in comprehensive cancer centres.⁴⁵ In order to integrate mid-level providers into healthcare, specialised cancer centres need to recognise the field of cancer nursing, and mid-level providers. Given the relatively short period in which mid-level providers can be trained and the need to maintain high productivity, allowing these providers to fit organisational schedules/needs can clearly address patient concerns. In view of the oligopolistic nature of many markets, it seems logical to tap into lower-priced labour markets.

Crossroads in the healthcare system provide an opportunity for cancer care to take an innovative approach in addressing both quality and customer experience.^{46,47} Aligning care with member engagement of the cancer survivor population, improvement of new facilities built towards addressing innovative treatments and access to preliminary results of clinical trials, and centres directing the focus onto health disparities are examples of how organisations are differentiating themselves, while providing a spectrum of cancer care. In order to maintain a branded image, specialised cancer care providers need to be able to balance multiple sectors of cancer care, differentiating care within each sector, and engage both patients and employee populations.^{48,49} The unique patient population seen at specialised cancer centres, or community care centres, varies; this allows the targeting of the health disparities in cancer care — resulting in specific research, education, prevention, care delivery, intervention strategies and promoting customer experiences. Further, revisiting brand vision and value defines how an organisation will be able to best compete in the market structure of the cancer care sector of choice.^{50,51} Incorporating additional approaches and care design into health-care delivery means that a cancer care provider needs to innovate delivery of brand value and ensure that the alignment of additional

care strategies with brand vision is an important part of customer experience.^{52,53} When aiming to address differentiation within a specified market or markets, cancer care organisations would need to re-evaluate how new strategies would affect patient experience and market share; this is more so in the prevention and screening sector of care owing to the pronounced nature of a pure competition market structure and low barriers to entry. Addressing secondary prevention as a product line, such as hepatitis C screenings in underserved populations, aligns with a public good market structure and an organisational brand vision of quality care, fostering reduced disease stage progression and morbidity;⁵⁴ these services provided through a different distribution channel strategy gives specialised centres an edge in competing among a duplicable service easily provided by any form of healthcare organisation, as well as community cancer care organisation strategies.

This paper used a structural approach based on economic theory to evaluate the various market structures involved in the entire range of cancer care products. Theoretically, the differences between these market structures are easier to validate. In practice, however, it may be harder to confirm these market structures and verify the impact of these structures.

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