How One Community Exercise Program for People Living With Cancer Impacted Health Care Utilization

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In Brief

Survival rates for patients with cancer have increased, meaning more patients are living with the effects of their disease and treatment. Initiatives to enhance the long-term quality of life are critically needed. Exercise is known to help with short-term outcomes, but less is known about long-term outcomes. This retrospective study based on administrative data included a total of 203 patients with cancer who participated in a 12-week supervised, community-based exercise program, called Stay Strong; it was offered as an adjunctive therapy during the first 5 years of their cancer journey. The main objectives were to investigate the number of hospitalizations, the length of hospital stays, and the number of physician service claims up to 2 years following the program, and to compare that data to a control group. Participants were matched using provincial administrative data based on sex, age (±5 years old), and admissions to the hospital (±2) in the year prior to the program. Over the 2-year follow-up period, patients with cancer who participated in Stay Strong had a significant reduction in hospital admissions, shorter length of hospital stays, and a reduced number of physician service claims compared with the control group. These findings suggest that there are potential benefits of participating in a community-based exercise program during a patient's cancer journey for both the patient and the health care system.

The number of people living with a cancer diagnosis has increased due to the growing and aging population. However, cancer mortality has been decreasing.[1] In Canada alone, 43% of residents will be diagnosed with cancer in their lifetime.[1] As a result, the need has never been greater for initiatives to help improve the quality of life for individuals living with cancer.

Physical activity during and following cancer treatment has resulted in multiple benefits.[2-4] Exercise is a valuable strategy for improving quality of life, body composition, physical fitness, immune function, sleep quality, and fatigue.[2,3] Exercise is also associated with a lower risk of cancer recurrence and improved overall survival.[4-6] Guidelines for cancer survivors indicate that exercise should be continuous throughout every part of the cancer journey.[7] Despite these recommendations, exercise is often discussed as a recommended adjuvant therapy but is not part of the standard of care.[8] Patients may experience financial barriers with out-of-pocket expenses to participate in exercise programs not embedded in the health care system.[8] In addition to personal barriers, such as initial physical activity level, fear, intimidation, or self-consciousness in a fitness-related setting, disease progression, other health changes, and/or competing interests leading to time constraints can all impact participation.[8] Patients reported that group-based, supervised, and tailored exercise programs are the most effective in maintaining adherence, partly due to the support and camaraderie associated with participation.[6,9-10]

> "A registered nurse and a physiotherapist assist with emotional support, physical evaluation, and the development of an individualized program based on the participant's goals and limitations while instructing on proper form and offering opportunities for progression or regression based on performance."

While the short-term effectiveness of exercise programs has been supported, a framework to evaluate long-term success still needs to be developed.[10,11] One method to track the long-term benefits beyond a pre- and post-exercise program approach is to use administrative

(Continued on page 9.)

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(Continued from page 7.)
data. Health care-related administrative data are used primarily for administrative and billing purposes but have been used increasingly for health-related research in recent years.[12] These databases provide stored data that continue to collect information over time regarding drugs and physician and hospital services (eg, physician service claims, hospital admissions and discharges), among other health-related services.[13] Depending on the desired use, this information can be anonymized and linked with various other databases. There are many benefits to using administrative data for research. Data are routinely collected from the general population, which can permit greater heterogeneity and provide the opportunity for longitudinal follow-ups over as long a period as desired.[13,14]

This study compared the number of hospitalizations, hospital length of stay, and the number of physician service claims for up to 2 years for a group of patients with cancer who participated in a 12-week, supervised, community-based exercise program compared to a matched control group drawn from administrative data.

In this study, participation in a 12-week exercise program revealed significant benefits for patients with cancer. These benefits included reduced hospital admissions, shorter hospital stays, and fewer physician visits, with the benefits continuing over a 2-year follow-up period.

Study Participants

Study participants were selected from among individuals who participated in a preexisting exercise program called Stay Strong. This exercise program is offered in a city of approximately 70,000 residents for individuals of all ages who have received a cancer diagnosis in the past 5 years. Participation in the program was permitted regardless of physical fitness level, cancer stage, cancer type, or previous treatment regimen (ie, chemotherapy, radiation, and/or hormonal therapy treatments). Patients who had received medical clearance and could ambulate independently (with or without assistive devices) were either invited to participate in this program by their oncologist or self-referred through an internal hospital advertisement.

Exercise Program

Stay Strong is a free, 12-week exercise program at a local fitness facility. The program includes 2 sessions per week. During their 60-minute sessions, patients participate in a series of strength exercises using a combination of resistance band exercises, free weights, exercise machines, and body weight, depending on individual abilities and limitations (eg, arm curl, chest press, leg extension) and cardiovascular exercises (eg, elliptical, walking, rowing machine). During each exercise session, participants are supervised by a registered nurse and a physiotherapist. These professionals assist with emotional support, physical evaluation, and the development of an individualized program based on the participant's goals and limitations while instructing on proper form and offering opportunities for progression or regression based on performance. The goal is to eventually reach the exercise guidelines for cancer survivors of 150 minutes of moderate to vigorous exercise per week and 2 or more days per week of resistance training.[15] In addition to the biweekly sessions, participants are provided full access to the community facility free of charge outside of program hours for additional unsupervised exercise sessions.

As part of study participation, participants are asked to share their provincial Medicare number, which can be linked with administrative data in other databases to evaluate outcomes of interest. Ethical approval (REB #2020-165) for this study was received from the University of New Brunswick Research Ethics Board.

Outcomes

As stated previously, study outcomes (areas of interest) were number of hospitalizations, length of hospital stay, and number of service claims. A Stay Strong Cancer Recovery Program database was used to identify participants who had completed the program and had a minimum of 1-year follow-up data available. Data to identify the Stay Strong participants (eg, provincial Medicare number) was transferred to the Department of Health of the province to enable the crossover to the New Brunswick Institute for Research, Data and Training (NB-IRDT). NB-IRDT provides researchers access to personal administrative data in a controlled, secure way to protect New Brunswick residents' privacy.[16] All personal identifiers of the individuals are removed, and each person is given a number to allow data to be securely linked between departments and datasets. Public datasets housed by NB-IRDT include the Cancer Registry, the Citizen Registry, Discharge Abstract Database, and Physician Billing datasets. Data were drawn from the Stay Strong dataset, the New Brunswick Cancer Registry, the Citizen Registry, Discharge Abstract Database, and Physician Billing datasets from 2014 to 2019 (final date was December 31, 2019), all housed within the NB-IRDT. The Cancer Registry and Citizen Registry were used to identify a matching cohort. This cohort was built based on cancer diagnosis, sex, age (within 5 years), having a minimum of 1 year of follow-up, and having the same hospitalization rate (0 or more) 5 years before baseline. Following the construction of the matched cohort, the Discharge Abstract Database and Physician Billing datasets were used to evaluate the outcomes of interest.

Data Analysis

Poisson distribution and logistics distribution regression models were used to evaluate the effect of the Stay Strong program participation on these outcomes. The evaluation was done to determine the outcomes after 1 and 2 years for eligible individuals who completed the Stay Strong program.

Results

Descriptive results for the sampled participants and matched cohort at baseline are presented in **Table 1.** Most Stay Strong participants were female (77.83%), with an average age of 60 years.

Second-year follow-up data were unavailable for 75 individuals (37%) from the Stay Strong cohort and 669 individuals (40%) from the matched cohort (**Figure 1**). A sensitivity analysis was conducted between the full sample and the cohort available for the second-year follow-up. Meaningful differences were found between the 2 groups regarding age ($P < .001$), with the cohort with the 2 years of follow-up being significantly younger (59 years old) than the full sample (63 years old). The means and standard deviations of all the variables of interest at various time points for the full sample are reported in **Table 2**. Notably, the average length of hospital stay was a week longer for individuals who did not participate in the exercise program (10 days) than for those who did (3 days).

The main analyses for the full sample and subsample are presented in **Table 3**. Despite the sensitivity analysis showing significant differences between the 2 groups, the overall outcomes from the analyses were not different. Over the 2-year follow-up, the results indicate that the patients with cancer who participated in the Stay Strong

(*Continued on page 12.*)

Table 1. Participant Baseline Characteristics (Full Sample)

VARIABLE	STAY STRONG PATIENTS (n = 203)	MATCHED COHORT (n = 1681)
Age (SD)	60.45 (10.78)	60.83 (3.78)
Sex		
Male (%)	45 (22%)	373 (22%)
Female (%)	158 (78%)	1308 (78%)
Malignant Neoplasm		
Breast (%)	114 (56%)	507 (30%)
Digestive organ (%)	23 (11%)	187 (11%)
Genital organ (%)	24 (12%)	250 (15%)
Other (%)	42 (21%)	737 (44%)

Figure 1. Participant Flow Chart

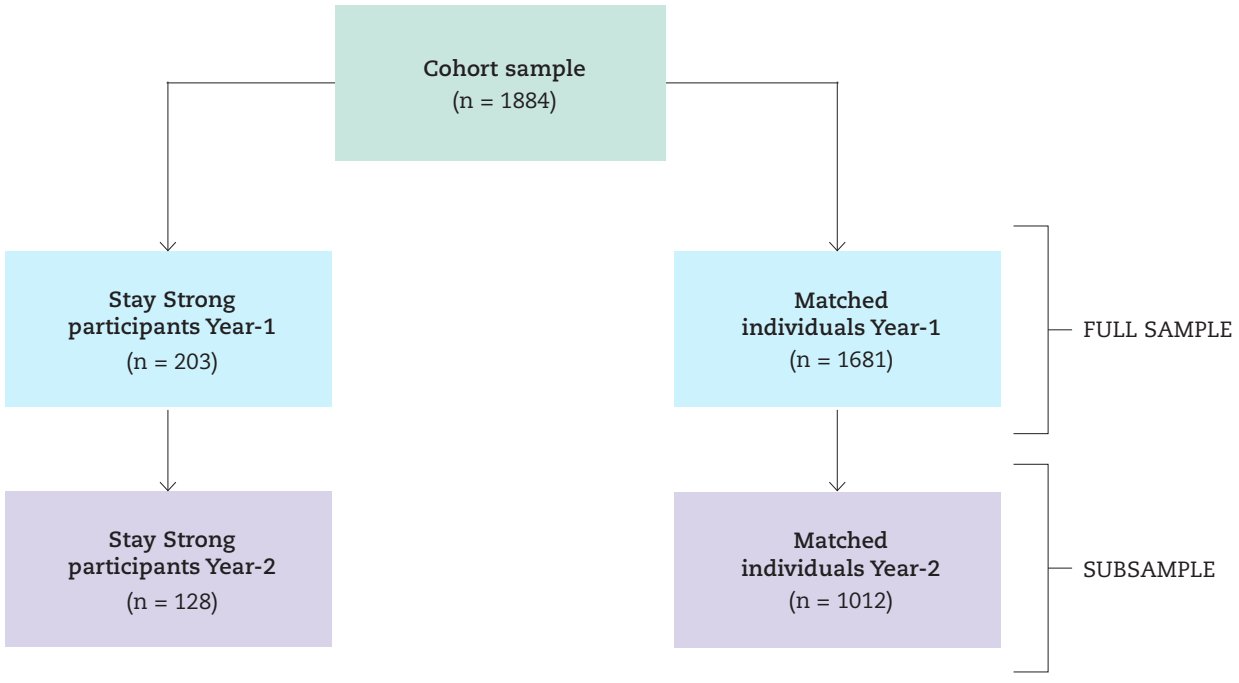

Table 2. Means and Standard Deviations for Measured Outcomes During Follow-Up Periods

	STAY STRONG PATIENTS	MATCHED COHORT
Hospital Admissions		
Baseline	1.09 (0.98)	1.16 (0.36)
Year 1	0.42 (0.87)	0.62 (0.37)
Year 2	0.38 (0.79)	0.61 (0.42)
Length of Hospital Stay (Days)		
Year 1	3.24 (5.04)	10.53 (7.48)
Year 2	3.40 (5.96)	10.47 (8.46)
Services Claimed		
Baseline	28.00 (11.32)	28.03 (3.92)
Year 1	17.84 (9.16)	20.75 (4.43)
Year 2	16.41 (9.90)	19.59 (4.45)

Table 3. Outcomes for Stay Strong Participants vs Matched Cohorts

	SUBSAMPLE RELATIVE RISK (95% CI)	FULL SAMPLE RELATIVE RISK (95% CI)
Hospital Admissions		
Year 0–1	0.70 (0.49; 0.99)*	0.68 (0.52; 0.89)*
Year 1–2	0.63 (0.44; 0.90)*	0.63 (0.44; 0.90)*
Year 0–2	0.66 (0.52; 0.85)**	0.66 (0.53; 0.82)**
Length of Hospital Stay (Days)		
Year 0–1	0.47 (0.38; 0.57)**	0.31 (0.26; 0.36)**
Year 1–2	0.32 (0.26; 0.40)**	0.33 (0.26; 0.40)**
Year 0–2	0.40 (0.34; 0.46)**	0.32 (0.28; 0.36)**
Services Claimed		
Year 0–1	1.99 (0.74; 3.24)**	2.91 (1.91; 3.91)**
Year 1–2	3.18 (1.86; 4.51)**	3.18 (1.8; 4.56)**
Year 0–2	2.57 (1.67; 3.48)**	3.01 (2.21; 3.80)**

*$p < .01$
**$p < .001$

(*Continued from page 10.*)
program had a significant reduction of hospital admissions rate ratio (RR) (95% CI) of 0.66 (0.52-0.85), a shorter length of hospital stay RR (95% CI) of 0.40 (0.34-0.46), and fewer physician service claims RR (95% CI) of 2.57 (1.67-3.48) compared with the control cohort. All outcomes, regardless of the follow-up time, showed significant benefits following the completion of the Stay Strong program.

Discussion

In this study, participation in a 12-week exercise program revealed significant benefits for patients with cancer. These benefits included reduced hospital admissions, shorter hospital stays, and fewer physician visits, with the benefits continuing over a 2-year follow-up period.

The majority of the Stay Strong program participants were female (77.83%). This is not surprising, as women tend to make up most group exercise classes,[17] and men often prefer to exercise individually outside of organized programs.[18] Additionally, most participants in this study were diagnosed with breast cancer, similar to other studies.[17,19]

Individuals who participated in the exercise program had a decrease in hospital admissions, despite the length of follow-up. Reduced hospital admissions indicate that exercise program participants are potentially less likely to require hospitalization. Exercise has been repeatedly shown to improve health outcomes in the general population.[20] Specifically, in the context of cancer, it has been shown to reduce symptoms and adverse effects of chemotherapy.[21] Exercise has also positively impacted the overall quality of life, fatigue, physical functioning, physical capacity, and muscular fitness during and after cancer treatment.[22,23] These findings, in addition to the outcomes of the current study, may suggest how exercise can improve health and reduce complications for people living with cancer, and can lead to the reduced need for hospital admission.

The length of hospital stays was also shorter in individuals who participated in the Stay Strong program compared with those who did not. Other exercise programs offered to the same population, such as Cancer Wellness for Life, have also reported reduced length of hospital stays.[24] This positive impact on the length of hospital stays may indicate improved recovery. Additionally, decreasing an individual's length of hospitalization improves psychological outcomes, which is important to consider, as it further supports patients with cancer.[25]

Individuals who participated in the Stay Strong exercise program were also less likely to visit a physician, as shown by the reduction in physician service claims. This finding was reflected when participation in an exercise program decreased the frequency of emergency department visits by 56%.[24] As previously discussed, the overall positive impact of exercise on well-being is also likely to be a major contributing factor to the decrease in physician visits.

Most importantly, these findings have shown how exercise can improve the patient experience. Study data also highlight some important implications that exercise during the cancer journey may have on potentially decreasing health care costs by reducing overall health care utilization or allowing resources to be allocated to other patients in need. The average cost of a standard hospital stay is $704 a day.[26] Reducing the need for a hospital stay by 7 days can mean a savings of nearly $5000 to the health care system.

These findings must be considered with their limitations. Although there are many benefits to using administrative data, it also prevents the acquisition of any additional desired information other than what was available and permitted to be released. More information about the population, such as cancer staging and time since diagnosis, would be beneficial for future studies. In addition, due to the study's longitudinal design, some people were lost from the sample over time (eg, moved out of the province). Also, when it comes to the details related to the Stay Strong exercise program, while there are many benefits to having individualized exercise programs, this makes the program difficult to replicate. Future studies could implement more data collection to include the participants' baseline fitness level before and after diagnosis, as well as the frequency of additional exercise completed outside of program hours. Most of the Stay Strong participants' malignancies were of the breast tissue (56%) compared with the matched cohort (31%). Site of disease could lead to different amounts of health care utilization. Finally, this study was completed as a single intervention compared to a matched control group, whereas future studies may consider implementing a randomized controlled trial.

In conclusion, despite these limitations, study findings support the growing evidence of the positive impact that exercise programs can have on cancer patients' treatment, overall outcomes, and utilization of health care services. Importantly, these benefits remained consistent over a 2-year follow-up period, indicating the potential impact that exercise programs can have on outcome sustainability. This study highlights the promising benefits associated with participation in a community-based exercise program during a patient's cancer journey for both the individual patient and the health care system. Future community research with patients with cancer is needed, and researchers should impose greater control of the intervention and sample studied, and include more information regarding possible confounding variables, such as comorbidities, to evaluate the overall impact exercise may have on people living with cancer. OI

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Declarations

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