Patients with Advanced Cancer: Factors Influencing Completion of an Interdisciplinary Rehabilitation Program

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Background

- The Cancer Rehabilitation Service (CRS) at the McGill University Health Centre (MUHC) is an 8-week, out-patient, interdisciplinary rehabilitation program.

- The global aim of the CRS is to empower cancer patients to improve their overall functioning and quality of life.

- An individually-prescribed exercise plan by the team physiotherapist is an important component of the program.

- Minimal research has focused on uncovering factors which influence the ability of patients with advanced cancer to complete and benefit from rehabilitation programs.

- The influence of chronic inflammation is of particular interest as it has been associated with functional limitations across several health conditions.[1]

- Chronic inflammation is mediated by pro-inflammatory cytokines, of which C-reactive protein (CRP) is a known, sensitive marker.[2]

Objectives

- To determine the following for patients with advanced cancer (stage 3 or 4) participating in an 8-week interdisciplinary cancer rehabilitation program:

- Demographic, clinical and laboratory factors associated with program completion.

- The relationships between
  - (a) Exercise adherence level and change in physical functioning
  - (b) CRP level at program onset and exercise adherence
  - (c) CRP level at program onset and change in physical functioning

Methods

Study Patients

- A retrospective analysis of clinical data was conducted on 83 patients with advanced cancer enrolled in the 8-week Cancer Rehabilitation Service (CRS) from January 1, 2008 – October 31, 2009.

- Each patient enrolled in the program received an individually-prescribed exercise program which generally included endurance, strength, flexibility and balance training 1-2x/wk with a physiotherapist and a home regimen.

Figure 1. Flowchart of Patients with Advanced Cancer who Participated in the CRS from January 1, 2008 – October 31, 2009

*Determined by physiotherapist based on chart review
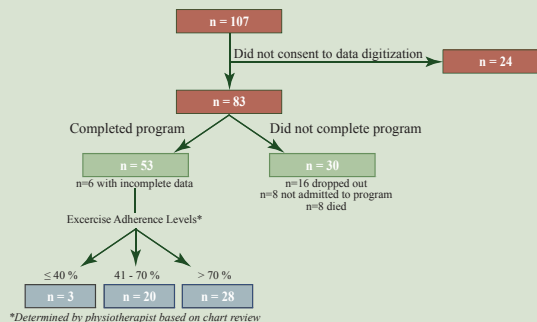
Data Collection and Statistical Analyses

- Univariate logistic regression was performed to determine the independent factors which influence completion of the 8-week program (See Table 2).

- A subsequent multivariate logistic regression was performed to determine the adjusted odds of completing the program (See Table 2).

- Paired *t*-tests were used to compare physical functioning at the start and end of the 8-week program for each exercise adherence level (See figure 2):
  - Objective Measure: 6-Minute Walk Distance (6-MWD)
  - Subjective Measure: Patient's perceived strength assessed by the Modified Edmonton Symptom Assessment Scale (ESAS)

  Normal Strength 0 1 2 3 4 5 6 7 8 9 10 Extremely Weak

- A Chi-square (χ^2) test was used to determine whether CRP level (< 10 vs. ≥ 10 mg/L) at program onset predicts exercise adherence level during the 8-week program.

- Simple linear regression was used to determine whether CRP level (< 10 vs. ≥ 10 mg/L) at program onset predicts changes in 6-MWD and perceived strength during the 8-week program.

Results

Table 1. Characteristics of Patients who Completed and Did Not Complete the Program

|	Complete	Incomplete	P - value
Age (yrs): mean (range)	58 (21-86)	62 (28-77)	0.21[a]
Sex: n (%)			0.17[b]
Male	29 (55)	21 (70)	
Female	24 (45)	9 (30)	
Cancer Stage: n (%)			0.23[b]
3	15 (28)	5 (17)	
4	38 (72)	25 (83)	
Cancer Diagnosis: n (%)			0.38[c]
Head & Neck	11 (21)	4 (13)	
Breast	7 (13)	3 (10)	
Colorectal	6 (11)	5 (17)	
Pancreas	5 (9)	1 (3)	
Lung	4 (8)	3 (10)	
Hepato-biliary	4 (8)	3 (10)	
Prostate	2 (4)	2 (7)	
Kidney/Bladder	0 (0)	2 (7)	
Multiple Myeloma	0 (0)	1 (3)	
Hematological	0 (0)	3 (10)	
Other	14 (26)	3 (10)	

a: Kruskal-Wallis test
b: Chi-square test
c: Fisher's exact test

Table 2. Logistic Univariate and Multivariate Analysis of Factors Associated with Program Completion

Factor	Odds Ratio (95% CI)	
	Univariate Analysis	Multivariate Analysis
Age	0.98 (0.94 – 1.02)	
Sex (Male vs. Female)	0.52 (0.20 – 1.34)	
Stage (3 vs. 4)	0.51 (0.16 – 1.57)	
6-MWD	1.00 (1.00 – 1.01)	
Perceived Strength	0.64 (0.47 – 0.88)	0.65 (0.47 – 0.92)
CRP (< 10 mg/L vs. ≥ 10 mg/L)	3.99 (1.55 – 10.29)	4.70 (1.62 – 13.63)
LDH (< 300 U/L vs. ≥ 300 U/L)	0.75 (0.27 – 2.04)	
Albumin (< 35 g/L vs. ≥ 35 g/L)	1.04 (0.96 – 1.12)	

- Age, sex, cancer stage (3 vs. 4), 6-MWD, LDH (< 300 U/L vs. ≥ 300 U/L), and albumin (< 35 g/L vs. ≥ 35 g/L) did not predict program completion.

- Perceived strength and CRP (< 10 mg/L vs. ≥ 10 mg/L) were independent predictors of completing the 8-week program.
  - For every 1 unit decrease in perceived strength, patients were 35% less likely to complete the program.
  - Patients with CRP < 10 mg/L were 4.7 times more likely to complete the program.

Figure 2. Exercise Adherence and Changes in Physical Functioning during an 8-week Cancer Rehabilitation Program
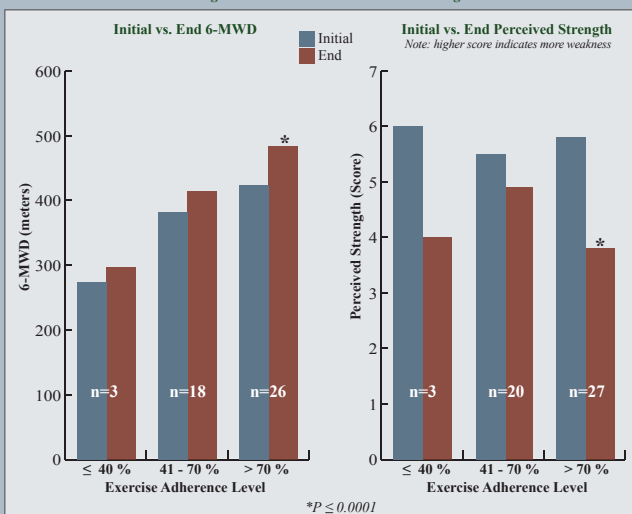
*P ≤ 0.0001

- Patients who adhered to > 70% of their exercise plan significantly improved their 6-MWD and perceived strength after the 8-week program (P < 0.0001).

- There was no significant association between CRP level (< 10 vs. ≥ 10 mg/L) at program onset and exercise adherence level [χ^2(5) = 2.45, P = 0.65] during the 8-week rehabilitation program.

- Simple linear regression analysis revealed that CRP level (< 10 vs. ≥ 10 mg/L) at program onset did not predict the change in 6-MWD (P = 0.25) nor perceived strength (P = 0.98) during the 8-week program.

Discussion

- Chronic inflammation (CRP ≥ 10 mg/L) in patients with advanced cancer was associated with a reduced ability to complete an 8-week rehabilitation program. In those who completed the program, CRP level did not predict exercise adherence level nor improvement in physical functioning.

- Exercise adherence > 70% was associated with improvements in both subjective and objective measures of physical functioning. Patients who adhered ≤ 70 % to their exercise program, nevertheless maintained their physical functioning, which in itself may be clinically relevant.

- The changes in 6-MWD and perceived strength were highly variable. This can likely be explained by the wide-range of cancer diagnoses and treatment stages in our study population which may differentially affect the response to exercise.

Limitations

- The defining criteria for the exercise adherence groups were not based on the literature and do not allow us to differentiate between adherence to the individual components of the exercise program (endurance, strength, flexibility and balance).

- There was a relatively small number of patients in the 41-70 % exercise adherence group and a clearly insufficient number in the ≤ 40 % exercise adherence group.

- Given the interdisciplinary nature of the rehabilitation program, we cannot conclude that the observed effects on physical functioning were solely the result of the exercise intervention.

Conclusions

- In patients with advanced cancer, CRP level and perceived strength are useful prognostic indicators for the ability to complete an interdisciplinary rehabilitation program. These indicators can be used to assist in patient selection for rehabilitation, and in directing patients to appropriate resources.

- By adhering to an individually-prescribed exercise plan within an 8-week interdisciplinary rehabilitation program, patients with advanced cancer can improve their physical functioning.

References

1. Brinkley TE, Leng X, Miller ME, et al: Chronic inflammation is associated with low physical function in older adults across multiple comorbidities. J Gerontol A Biol Sci Med Sci 64:455-61, 2009
2. Gabay C, Kushner I: Acute-phase proteins and other systemic responses to inflammation. N Engl J Med 340:448-54, 1999