

Long-Term Survivorship and Quality of Life After Cytoreductive Surgery Plus Intraperitoneal Hyperthermic Chemotherapy for Peritoneal Carcinomatosis

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Background: Cytoreductive surgery plus intraperitoneal hyperthermic chemotherapy with mitomycin C for peritoneal carcinomatosis is used as a palliative treatment for a variety of malignancies. The purpose of this study was to measure the quality of life (QOL) of survivors (>3 years) after treatment.

Methods: Patients were interviewed by telephone with the following tools: (1) the Functional Assessment of Cancer Therapy–Colon (FACT-C), (2) the Short Form of the Medical Outcomes Study Questionnaire, (3) the Center for Epidemiologic Studies–Depression scale, (4) the Life Appreciation scale, (5) the Psychosocial Concerns Questionnaire, and (6) performance status rating.

Results: Seventeen (10 appendix, 5 large intestine, 1 ovarian, and 1 peritoneum) of 109 patients were interviewed from 3.1 to 8.0 years after treatment. Ten patients (62.5%) described their health as excellent or very good. No limitations on moderate activity were reported in 94% of cases. Paired *t*-tests were used to compare 10 patients who had baseline QOL data. FACT mean difference scores and *P* values (positive difference scores indicate improved QOL) were functional well-being: 4.9, *P* = .01; physical well-being: 3.3, *P* = .05; and FACT total: 14.3, *P* = .02.

Conclusions: Long-term survival with good QOL is possible for selected patients with peritoneal carcinomatosis after cytoreductive surgery plus intraperitoneal hyperthermic chemotherapy.

Key Words: Quality of life—Intraperitoneal hyperthermic chemotherapy—Survivorship—Peritoneal carcinomatosis.

Peritoneal carcinomatosis (PC) is associated with poor prognosis and diminished quality of life (QOL).^{1,2} Survival is often estimated in months,³ and the patient's functional status may be severely hampered. Most clinicians do not consider curative options for patients with PC, but rather consider comfort and palliation of symp-

toms. Long-term survival is rare in this patient population treated with conventional therapy.^{4,5} A phase II clinical trial conducted at Wake Forest University School of Medicine used cytoreductive surgery plus intraperitoneal hyperthermic chemotherapy (IPHC) in 109 patients treated for a variety of diagnoses.⁶ A subsample of these patients (*n* = 64) had baseline QOL and follow-up QOL measurements assessed at four different time points over 1 year. Results of the QOL study indicated that survivors tolerated the treatment reasonably well and returned to baseline QOL within 3 months after treatment.⁷

Long-term survivorship issues are quite different from what might be expected within the first 6 to 12 months after intensive treatment for any form of cancer. Often, many patients may experience significant threats to QOL immediately after intensive treatments.⁸ However, with the prospect of returning to a normal life, patients may be

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willing to undergo considerable treatment-related discomfort. Some studies support the fact that many patients are willing to endure severe toxicity for as little as 1 extra month of life.^{9,10} However, if such QOL deficits persist, patients may be less likely to choose treatments such as surgery plus IPHC, because the price for survival may be too great. Living with significant debilitation and comorbidities as a direct result of therapy may create additional problems in the future. Because few patients survive longer than 3 years after IPHC, there are no QOL data over the long term in this population. The objective of this study was to assess overall QOL, psychosocial concerns, and depressive symptoms in patients at least 3 years after treatment with cytoreductive surgery plus IPHC.

METHODS

All consecutively treated disease-free patients entered onto Comprehensive Cancer Center of Wake Forest University's protocol 99491 between January 1, 1992, and December 31, 1997, were eligible for this study. At the last assessable date (October 2000) before the initiation of this study, 30 survivors (27.5%) were identified from a sample of 109 patients, with 8 patients having survived >5 years after treatment. All patients had been treated with cytoreductive surgery plus IPHC. Briefly, this treatment involved the following: after cytoreductive surgery, catheters were placed in the abdomen to allow for the circulation of fluid (3 L) and heated mitomycin C (40.5°C) through the abdominal cavity for 2 hours during surgery, with a heat-exchange pump. After the perfusion, patients were transferred to the intensive care unit for follow-up care. This procedure has been described in detail elsewhere.⁶ A subsample of this group, approximately 60%, had been administered QOL questionnaires before their IPHC. Additionally, any survivor treated with IPHC at the Comprehensive Cancer Center of Wake Forest University from January 1, 1998, through December 31, 1999, was surveyed.

All surviving patients were identified through a data registry maintained in surgical oncology. They were telephoned by the research interviewer and invited to participate in the study. If they agreed, they were sent a consent form along with the assessment questionnaires. During this initial contact, the research interviewer scheduled a follow-up phone call where the interview portion of the study was conducted. The interview consisted of recording the patient's responses to the standardized questionnaires and open-ended questions designed to elicit more specific issues related to long-term survivorship in this patient population.

Instruments

The Functional Assessment of Cancer Therapy–Colon Scale

The general version of the Functional Assessment of Cancer Therapy (FACT-G) is a 28-item self-report questionnaire that measures QOL in cancer patients.¹¹ The FACT-Colon (FACT-C) is the FACT-G plus the nine-item colon subscale. We chose the colon subscale because it includes items that address symptoms associated with disseminated PC. The FACT consists of five subscales measuring physical (PWB), functional (FWB), social/family (SFWB), and emotional well-being (EWB) and satisfaction with the relationship with the doctor. The FACT can be either self-administered or used in an interview format and is easily completed in 5 to 10 minutes. Patients are asked to rate themselves on how they feel today and over the past 7 days. The FACT-G provides subscale scores and an overall total QOL score. A higher score indicates better QOL. Cronbach's alpha for each subscale has been reported as follows: PWB, .82; FWB, .80; SFWB, .69; EWB, .74; relationship with the doctor, .65; and total FACT-G, .89. The FACT has been used in many clinical trials.

The Medical Outcomes Study, Short Form

The Medical Outcomes Study, Short Form (SF-36)^{12–14} is a 36-item generic health measure that assesses eight areas of perceived health: physical functioning, role-physical, role-emotional, bodily pain, general health, vitality, social functioning, and mental health. For physical functioning, the patient is asked to rate the degree to which 10 activities (vigorous activity, moderate activity, lifting and carrying groceries, walking several flights of stairs, walking one flight of stairs, bending and kneeling or stooping, walking greater than a mile, walking several blocks, walking one block, and bathing and dressing) are limited on a scale with three possible descriptors (not limited, limited a little, and limited a lot). A higher score indicates better functioning. Scores range from 0 to 100 and have been reported on a variety of different patient populations.¹³

The Center for Epidemiologic Studies–Depression Scale

The Center for Epidemiologic Studies–Depression scale (CES-D)^{15,16} is a 20-item self-report measure developed to screen for depressive disorders. It has high sensitivity and positive predictive value for detecting depressive disorders (major depression and dysthymia). Cutoff scores indicate the likelihood that a subject meets *Diagnostic and Statistical Manual of Mental Disorders*

(4th ed.) criteria for the diagnosis of depression. A score of ≥ 17 indicates that the patient has significant depressive symptoms and would be categorized as a possible case of depression. A higher score indicates the presence of more depressive symptoms.

The Eastern Cooperative Oncology Group Performance Status Rating Scale

This¹⁷ is a single-item rating of activity level in which 0 = fully ambulatory without symptoms; 1 = fully ambulatory with symptoms; 2 = requiring bed rest (or equivalent) $< 50\%$ of the waking day; 3 = requiring bed rest (or equivalent) $> 50\%$ of the waking day; and 4 = bedridden. Patients rated their current activity level.

Life Appreciation Scale

This scale consists of a horizontal line anchored at one end with -5 (worse) to 0 (same as before) to $+5$ (better). Patients are asked to circle the number on the line that indicates the extent to which their appreciation for life has changed because of their cancer.

Patient Psychosocial Concerns

The Stem Cell Concerns Questionnaire is a 30-item self-report measure created to identify specific concerns to patients after stem cell transplantation.¹⁸ It was adapted for use in an IPHC population because the specific concerns are applicable to IPHC patients in this long-term follow-up study. Patients indicate whether a given item is (1) a concern in the past month; (2) a concern since IPHC, but not in the past month; (3) not a concern since IPHC; or (4) not applicable. Two composite scores were calculated: total number of current concerns and post-IPHC concerns was the sum of psychosocial items that were either a current concern or a concern since IPHC, but not within the past 30 days.

Social Demographic Information, Energy Level, and Additional Items

Standard sociodemographic information (age, sex, race, marital status, and so on) was collected. Additional questions were asked, especially about physical appearance and energy level, because many patients entered treatment with malignant ascites, a condition that often changes physical appearance and functional status dramatically. In one final item, we asked patients to assess the degree to which they had regrets about undergoing the IPHC treatment.

Statistical Analysis

Descriptive statistics, including means and SDs for continuous measures and frequencies for categorical

variables, were generated. For the primary QOL measure in the study, the FACT-C, repeated-measures analysis of variance over the two time points of the study was conducted for those patients who participated in the original QOL study and had baseline FACT scores. For the CES-D, patients' answers to individual questions were compiled to assess the person's likelihood of depression. For those survivors who were assessed at only one time point, mean scores are reported for the SF-36.

RESULTS

Patient Characteristics

Demographics and patient characteristics are listed in Table 1. A total of 109 patients were treated at the Comprehensive Cancer Center of Wake Forest University between January 1, 1992, and December 31, 1997. Twenty-nine patients had survived ≥ 3 years and were available for analysis at the last recorded date of medical follow-up conducted before the initiation of this study. Of this group, 12 patients did not participate for the following reasons: did not respond to repeated telephone calls ($n = 5$); were deceased ($n = 3$); were unable to complete because they were hospitalized ($n = 2$); declined ($n = 1$); and had recurrent disease ($n = 1$). A total of 17 patients were available for questionnaire response and analysis. The mean time since initial treatment with IPHC was 5.3 ± 1.6 years (range, 3.1–8.0 years). In addition to omentectomy, peritoneal surface debulking, and resection for all patients, 3 of 17 also underwent splenectomy, and 10 of 17 had resection of bowel (either small [4 of 10] or large [8 of 10]); 2 had both small- and large-bowel resections). The resection status for each tumor type was recorded as follows: R_0 = appendix ($n = 4$), large intestine ($n = 3$), or ovary ($n = 1$); R_1 = appendix ($n = 1$) and large intestine ($n = 1$); R_{2a} = appendix ($n = 2$) and large intestine ($n = 1$); R_{2b} = appendix ($n = 3$); and R_{2c} = primary PC ($n = 1$).

Quality of Life

FACT mean scores (SD) were recorded as follows: PWB, 26.7 (2.4); SFWB, 25.3 (3.4); EWB, 21.9 (2.1); FWB, 25.2 (3.6); and Treatment Outcome Index, 84.4 (7.9). The overall FACT score was 106.2 (10.2). Paired t -tests were used to compare 10 patients with baseline QOL scores and follow-up scores recorded in this study. (The baseline scores were initially recorded in a study reported elsewhere.¹⁹) Mean difference scores and P values (positive difference scores indicate improved QOL) were FWB: 4.9, $P = .01$; PWB: 3.3, $P = .05$; and FACT total: 14.3, $P = .02$. Comparisons on SFWB and EWB and the FACT-C subscale were not significant.

TABLE 1. Patient characteristics and demographic information

Variable	n	%
Total patients (Mean age, 58.8 y, range, 34–75 y)	17	100
Sex		
Female	6	35
Male	11	65
Race		
Black	1	6
White	16	94
Education		
High school or less	5	29
Some college	4	23
College graduate	5	29
Postgraduate	3	18
Employment status		
Full-time	7	41
Retired	4	23
Disabled	4	23
Part-time	1	6
Missing	1	6
Income (\$)		
<30,000	6	35
30,000–70,000	4	23
>70,000	5	29
Missing	2	13
Marital status		
Married	12	71
Single	1	6
Separated/divorced	3	17
Widowed	1	6
Diagnosis		
Appendix	10	59
Large intestine	5	29
Ovarian	1	6
Primary peritoneal carcinomatosis	1	6
Ascites		
Yes	5	29
No	12	71
Resection status ^a		
R ₀	8	47
R ₁	2	13
R _{2a}	3	17
R _{2b}	3	17
R _{2c}	1	6

^a R₀, complete removal of all visible tumor and negative cytology or negative microscopic margins; R₁, complete removal of all visible tumor and positive cytology or microscopic margins; R_{2a}, minimal residual tumor, nodule(s) ≤.5 cm; R_{2b}, gross residual tumor and nodules >.5 cm but ≤2 cm; R_{2c}, extensive disease remaining and nodules >2 cm.

Furthermore, when comparisons were made between the long-term data of this study and after surgery (6-month follow-up QOL data), the following mean differences were greater compared with the initial follow-up, which was an average of 13.2 ± 11.7 days after surgery: PWB: 9.0 ± 4.4 points, *P* = .0003; FWB: 12.0 ± 6.2 points, *P* = .0004; Treatment Outcome Index: 27.7 ± 14.9 points, *P* = .0005; and overall FACT score: 23.4 ± 14.6, *P* =

.0013. When long-term data were compared with 1-year scores, PWB was 1.2 ± 1.5 points higher (*P* = .037). No other comparisons were significant. There were also no differences on the FACT subscale and overall QOL scores between those patients with appendiceal cancer and those with all other diagnoses.

General Health, Life Satisfaction, and Life Appreciation

On the SF-36 questionnaire, patients rated their general health as follows: very good to excellent, 10 (62.5%); good, 4 (25%); and fair, 2 (13%). In comparison to 1 year previously, patients rated their health in general as follows: much or somewhat better, 5 (31%); the same, 10 (63%); and somewhat worse, 1 (6%). Overall mean scores and SDs on the various subscales of the SF-36 are reported in Figs. 1 and 2 along with general population norms for men and women from 55 to 64 years of age. Limitations in various activities are listed in Table 2.

Patients were asked to rate their life satisfaction and appreciation since their treatment. On the Life Satisfaction Scale, 3 patients (18%) indicated that things were different and worse, 1 patient (6%) indicated that things were approximately the same, and the remaining 13 patients (76%) indicated that everything was different but better since their treatment. On the Life Appreciation Scale, patients were asked, “Has there been a change in your appreciation of life now because of your cancer?” All patients indicated an increase in life appreciation.

Employment, Energy Level, Returning to Normal, and Performance Status

Eight patients (47%) had returned to work (seven full-time and one part-time), four patients (24%) were retired, four (24%) were disabled, and one (5%) did not report employment status. Patients were asked to estimate their current energy level relative to what was normal for them. Eleven patients (77%) rated their energy level at ≥90%, with 6 of the 11 patients reporting their energy level at 100%. Three patients (23%) rated their energy level from 55% to 70%. Three patients did not report their current energy level. A total of 14 patients (82%) reported resuming from 90% to 100% of their normal activities, whereas the remaining 3 patients (18%) reported returns to 40%, 60%, and 75% of normal activities. Ratings on the Eastern Cooperative Oncology Group performance status rating scale were as follows: 0, *n* = 15 (88%); 1, *n* = 1 (6%); and 2, *n* = 1 (6%).

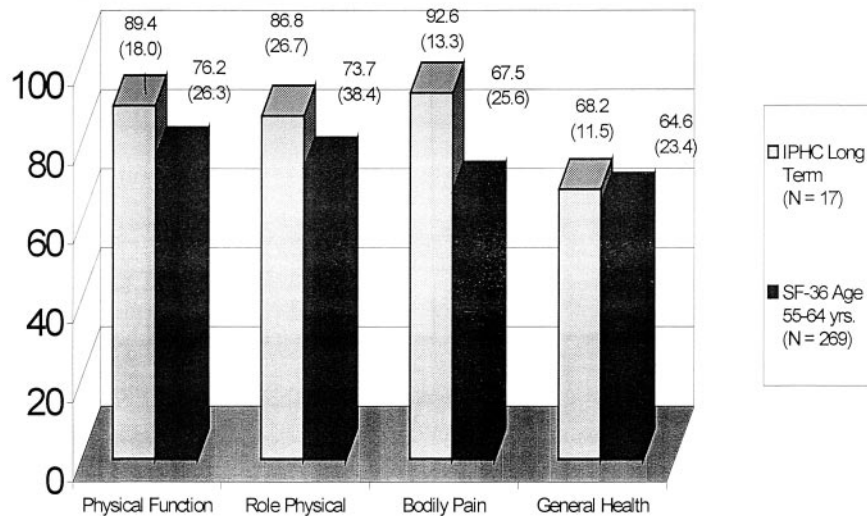


FIG. 1. Mean (SD) scores on four subscales of the Medical Outcomes Study, Short Form (SF-36) health survey for study patients compared with national norms. IPHC, intraperitoneal hyperthermic chemotherapy.

Attitude Toward Treatment

When patients were asked to rate the degree of difficulty they experienced when undergoing the cytoreductive surgery plus IPHC treatment on a scale from 0 (not at all difficult) to 10 (very much difficult), five (29%) rated the treatment from 0 to 3, and seven (41%) rated their treatment from 8 to 10. The remaining five patients (29%) rated their treatment from 4 to 7. The mean difficulty rating for the IPHC treatment was 5.3 (SD, 3.5). When asked whether or not the patients regretted having their IPHC treatment on a 5-point scale from “not

at all” to “very much so,” all 17 patients reported not at all regretting having the IPHC treatment. Patients rated to what extent they had returned to their normal activity level on a scale ranging from 0% to 100% of normal. The mean percentage activity level rating was 91.5% (SD, 17.3%).

We asked the patients a series of questions about their cytoreductive surgery plus IPHC treatment. Nine patients (53%) believed that there was no treatment that could help them before they learned about IPHC. Five patients (30%) were told that there were no treatments left except

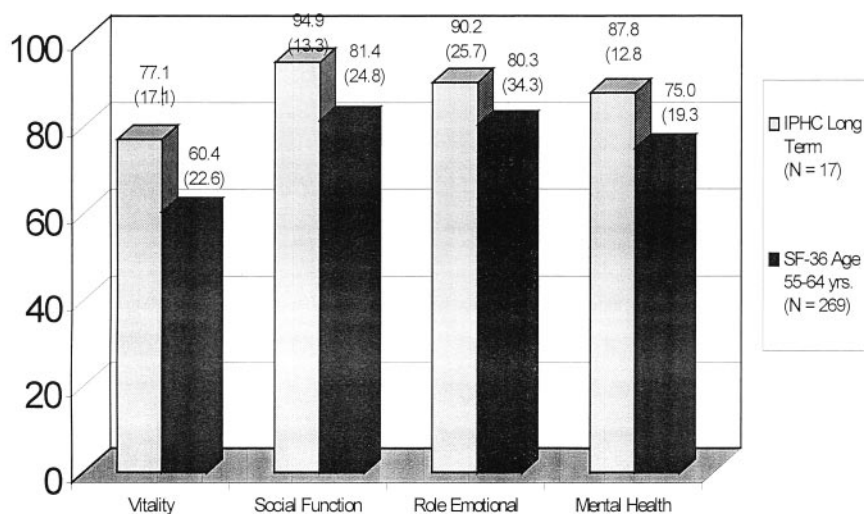


FIG. 2. Mean (SD) scores on four subscales of the Medical Outcomes Study, Short Form (SF-36) health survey for study patients compared with national norms. IPHC, intraperitoneal hyperthermic chemotherapy.

TABLE 2. SF-36 activities of daily living

Variable	Limited a lot n (%)	Limited a little n (%)	Not limited n (%)
Vigorous activities, such as running	3 (18)	7 (41)	7 (41)
Moderate activities, such as playing golf	0	1 (6)	16 (94)
Lifting/carrying groceries	1 (6)	0	16 (94)
Climbing several flights of stairs	2 (12)	2 (12)	13 (76)
Climbing one flight of stairs	0	1 (6)	16 (94)
Bending, kneeling, or stooping	1 (6)	3 (18)	13 (76)
Walking more than one mile	1 (6)	3 (18)	13 (76)
Walking several blocks	0	1 (6)	16 (94)
Walking one block	0	1 (6)	16 (94)
Bathing or dressing yourself	0	1 (6)	16 (94)

the IPHC procedure. Seven patients (41%) reported that they were told they were dying. Seven patients (44%) had tried some form of complementary therapy.

Depressive Affect and Psychosocial Concerns

The mean score for the CES-D scale was 6.3 (SD, 8.3). Only one patient scored high enough to be classified as a "case," that is, a patient who had significant enough

depressive symptoms to qualify for a diagnosis of clinical depression.

Table 3 lists (1) psychosocial concerns that the patients had during the past 30 days or since their treatment, but not within the past 30 days; and (2) areas that were never a concern. More than 15% of patients indicated current concern in the following areas: disease recurrence, sexual life, and poor sleep. Although these

TABLE 3. Psychosocial concerns, n (%)

Concern	Current concern ^a	Past concern ^b	Not a concern ^c	Not applicable/missing
Whether my disease will return	3 (17)	10 (59)	4 (24)	0
Energy level	2 (12)	4 (24)	10 (58)	1 (6)
Whether I will return to normal	1 (6)	3 (18)	10 (58)	3 (18)
Feeling tense or anxious	2 (12)	1 (6)	12 (70)	2 (12)
Feeling depressed	2 (12)	0	13 (76)	2 (12)
Ability to participate in enjoyable leisure activities	1 (6)	2 (12)	12 (70)	2 (12)
Personal appearance	1 (6)	5 (29)	9 (53)	2 (12)
Return to work	0	3 (27)	8 (73)	6 (35)
Difficulty remembering/concentrating	2 (12)	0	12 (71)	3 (18)
Sexual life	3 (18)	2 (12)	9 (52)	3 (18)
Poor appetite	1 (6)	3 (18)	11 (64)	2 (12)
Poor sleep	3 (21)	2 (14)	9 (53)	3 (18)
My goals in life	1 (6)	2 (12)	12 (71)	2 (12)
Difficulties with my medical insurance	2 (12)	5 (30)	8 (47)	2 (12)
Impatience and irritability with others	1 (6)	2 (12)	10 (59)	4 (24)
Others not understanding my needs	1 (6)	2 (12)	11 (65)	3 (18)
Whether the things I am thinking/feeling are typical of other IPHC patients	1 (6)	2 (12)	8 (47)	6 (35)
Others not knowing what to say to me or how to treat me	0	1 (6)	13 (76)	3 (18)
Why all this happened to me	1 (6)	3 (18)	10 (59)	3 (18)
Others babying me or being overprotective	0	1 (6)	12 (70)	4 (24)
Communicating with my spouse/partner	1 (6)	0	11 (65)	5 (29)
Relationship with spouse/partner	1 (6)	3 (18)	8 (47)	5 (29)
My understanding of my disease/treatment	1 (6)	2 (13)	13 (81)	1 (6)
Relationship with my children	0	0	14 (82)	3 (18)
Ability to be affectionate	0	1 (6)	12 (70)	4 (24)
Relationship with friends/coworkers	1 (6)	1 (6)	13 (76)	2 (12)
Spiritual life	1 (6)	0	14 (82)	2 (12)
Not being sure what things my doctor doesn't want me to do	0	2 (12)	12 (70)	3 (18)
Communicating with my physician/nurse	1 (6)	1 (6)	13 (76)	2 (12)
Whether I'm getting good medical care	0	3 (18)	11 (64)	3 (18)

IPHC, intraperitoneal hyperthermic chemotherapy.

^a Concern within past 30 days.

^b Concern since IPHC but not within past 30 days.

^c Not a concern since IPHC.

were not a concern within the past month, $\geq 25\%$ of patients had concerns in the following areas: disease recurrence, energy level, appearance, returning to work, difficulties with medical insurance, and relationship with their spouse. Many psychosocial areas were never a concern for $>70\%$ of this patient population after treatment.

DISCUSSION

The purpose of this study was to survey survivors after treatment for PC, given that long-term survival with PC is rare. We wanted to establish QOL scores in this patient population relative to normal population norms, identify psychological symptoms that might be associated with posttreatment survivorship, and identify psychosocial concerns that remain issues for long-term survivors. Previous research has established initial findings with regard to short-term effects after treatment with cytoreductive surgery plus IPHC.⁷

We were able to compare baseline overall QOL scores recorded before treatment⁷ for 10 patients in this population with their most recent scores (recorded in this study). Improvements in QOL were evident in FWB and PWB and in overall QOL scores. This was not unexpected, given that FWB and PWB scores measure deficits that might be apparent with changes in daily activities and interruption in work status. It is not surprising that improvements in QOL are measurable with these subscales. Furthermore, for the most part, long-term QOL scores were not significantly different from the 3-, 6-, and 12-month scores, suggesting that recovery of overall QOL in the survivor population is quite rapid; it occurs as early as 3 months and seems to peak at 6 to 12 months.

The SF-36 QOL questionnaire has been used to assess health in the general population.¹¹ Norms for the various subscales and the overall questionnaire have been published. These scores allow for comparisons with the participants in this study. Although the ideal comparison would be with age-matched non-cancer-patient controls, comparisons with the general population norms on this instrument can be useful. On general health, 87% of IPHC survivors rated themselves from good to excellent. Furthermore, 94% rated their health as either the same or somewhat better than it was 1 year before. In only two categories—vigorous activities and climbing several flights of stairs—did $>10\%$ of patients describe themselves as “limited a lot.” For six categories of activities of daily living, 94% of survivors listed no limitations at all.

One vexing problem facing QOL researchers conducting long-term follow-up studies is to what extent a disease process and subsequent treatment have affected the patient's overall well-being compared with what changes in QOL would have occurred during the normal process of aging. In short-term follow-up studies, treatment effects such as those observed after IPHC have an immediate effect on overall functioning. However, over a long period such as the one measured in this study, to what extent could the treatment, disease, or both contribute to the patient's QOL up to 8 years later? Because this question is difficult, if not impossible, to answer with precision, relative comparisons are necessary to give meaning to these numbers. We have attempted to make these comparisons in two ways. First, we had a subsample with baseline scores on the FACT. This allowed for comparisons of patients with themselves with regard to their baseline and subsequent follow-up assessment. However, this comparison is flawed because the aging process may contribute to functional and physical declines. Our own data, particularly with regard to FWB and PWB, are particularly encouraging because one might expect decrements in these areas over time. However, in this patient population, FWB and PWB scores actually increased on the FACT.

We used a second method of comparison by contrasting long-term IPHC survivors with an age-similar sample from the general population on the eight subscales of the SF-36. The mean score on the SF-36 general health subscale was 68.2 ± 11.5 , which is comparable to the national norms median score for this age group (67.0 ± 23.4). Furthermore, 76% of patients indicated that their overall life satisfaction was actually better since treatment and that their overall life appreciation also increased. Our findings are similar to those reported previously in bone marrow transplant recipients,²⁰ where patients noted a positive transformation after the crisis of cancer diagnosis and treatment. This may be particularly true when patients encounter their own mortality and are faced with life's time-limitedness. This encounter with mortal time may serve as a wake-up call to many to reorder their daily priorities.

Because cytoreductive surgery plus IPHC is a relatively new, invasive approach, we asked patients to rate their experience with treatment. No patient regretted having the treatment. More than 50% of the patients had been told that there was no treatment that could help them before they learned about IPHC. More than 40% of the patients in this group were told that they were dying. Although long-term survivors may be clearly biased in this regard, it is reassuring that none indicated that they regretted undergoing the procedure.

There are several limitations in this study. First, the small number of patients surveyed suggests caution in interpreting these findings. Second, because this study was cross-sectional, it is difficult to know what the treatment trajectory of recovery might be in this patient population. In other words, because survivors range from 3 to 8 years after treatment, we cannot know at what point the patients might have returned to normal after the initial treatment. Third, there was no matched control group for comparison. Comparisons with age-similar norms in the general population are not ideal in this setting.

Despite these limitations, the data here support the assumption that long-term survivors of PC treated with cytoreductive surgery plus IPHC can return to a life of quality. Although some problems remain in terms of psychosocial concerns, for the most part, these patients have achieved survivorship while at the same time not sacrificing overall QOL. These data provide a foundation of hope and optimism in a patient population in which treatment options are limited and survival without intensive treatment is impossible. These survivors are pioneers.

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REFERENCES

1. Spratt JS, Edwards E, Kubata T, Lineberg R, Tseng MT. Peritoneal carcinomatosis: anatomy, physiology, diagnosis, management. *Curr Probl Cancer* 1986;10:555–84.
2. Sugarbaker PH. *Peritoneal Carcinomatosis. Drugs and Diseases*. Boston: Kluwer, 1996.
3. Chu DZ, Lang NP, Thompson C, Osteen PK, Westbrook KC. Peritoneal carcinomatosis in nongynecologic malignancy. A prospective study of prognostic factors. *Cancer* 1989;63:364–7.
4. Marcus EA, Weber TK, Rodriguez-Bigas MA, Driscoll D, Mero-pol NJ, Petrelli NJ. Prognostic factors affecting survival in patients with colorectal carcinomatosis. *Cancer Invest* 1999;17:249–52.
5. Sadeghi B, Arvieux C, Glehen O, et al. Peritoneal carcinomatosis from non-gynecologic malignancies: results of the EVOCAPE 1 multicentric prospective study. *Cancer* 2000;88:358–63.
6. Loggie BW, Fleming RA, McQuellon RP, Russell GB, Geisinger KR. Cytoreductive surgery with intraperitoneal hyperthermic chemotherapy for disseminated peritoneal cancer of gastrointestinal origin. *Am Surg* 2000;66:561–8.
7. McQuellon RP, Loggie BW, Fleming RA, Russell GB, Lehman AB, Rambo TD. Quality of life after intraperitoneal hyperthermic chemotherapy (IPHC) for peritoneal carcinomatosis. *Eur J Surg Oncol* 2001;27:65–73.
8. McQuellon RP, Russell GB, Rambo TD, et al. Quality of life and psychological distress of bone marrow transplant recipients: the 'time trajectory' to recovery over the first year. *Bone Marrow Transplant* 1998;21:477–86.
9. McQuellon RP, Muss HB, Hoffman SL, Russell G, Craven B, Yellen SB. Patient preferences for treatment of metastatic breast cancer: a study of women with early-stage breast cancer. *J Clin Oncol* 1995;13:858–68.
10. McQuellon RP, Muss HB, Hoffman S, et al. The influence of treatment toxicity on treatment preferences of women with breast cancer. *Proc Am Soc Clin Oncol* 1994;13:76.
11. Cella DF, Tulsky DS, Gray G, et al. The Functional Assessment of Cancer Therapy scale: development and validation of the general measure. *J Clin Oncol* 1993;11:570–9.
12. Ware JE Jr, Snow KK, Kosinski M, Gandek B. *SF-36 Health Survey. Manual and Interpretation Guide*. Boston: Nimrod Press, 1993.
13. McHorney CA, Ware JE Jr, Lu JF, Sherbourne CD. The MOS 36-item Short-Form Health Survey (SF-36): III. Tests of data quality, scaling assumptions, and reliability across diverse patient groups. *Med Care* 1994;32:40–66.
14. McHorney CA, Ware JE Jr, Raczek AE. The MOS 36-Item Short-Form Health Survey (SF-36): II. Psychometric and clinical tests of validity in measuring physical and mental health constructs. *Med Care* 1993;31:247–63.
15. Radloff LS, Teri L. Use of the Center for Epidemiological Studies-Depression Scale with older adults. *Clin Gerontol* 1986;5:119–36.
16. Radloff LS. The CES-D scale: a self-report depression scale for research in the general population. *Appl Psychol Meas* 1977;1:385–401.
17. Zubrod CG, Schneiderman M, Frei E, et al. Appraisal of methods for the study of chemotherapy of cancer in man: comparative therapeutic trial of nitrogen mustard and triethylene thiophosphoramide. *J Chronic Dis* 1960;11:7–33.
18. Andrykowski MA, Cordova MJ, Hann DM, Jacobsen PB, Fields KK, Phillips G. Patients' psychosocial concerns following stem cell transplantation. *Bone Marrow Transplant* 1999;24:1121–9.
19. McQuellon RP, Loggie BW, Russell GB, et al. Health related quality of life (QOL) before and after surgically directed intraperitoneal hyperthermic chemotherapy (IPHC) for peritoneal carcinomatosis (PC) (abstract). *Proc Am Soc Clin Oncol* 1997;16:76a.
20. Andrykowski MA, Brady MJ, Hunt JW. Positive psychosocial adjustment in potential bone marrow transplant recipients: cancer as a psychosocial transition. *Psycho-Oncology* 1993;2:201–76.