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Psychosocial predictors of hope two years after diagnosis of colorectal cancer: implications for nurse-led hope programs

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Gold Coast Health
Building a healthier community

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Professor Yiqun Gan
Editor, European Journal of Cancer Care

Dear Professor Gan

Re: Psychosocial predictors of hope two years after diagnosis of colorectal cancer: implications for nurse-led hope programs

Thank you for the opportunity to revise the above manuscript. We have incorporated comments from the reviewers into the R2 manuscript. I have noted changes in the manuscript using blue font. To assist you and the reviewers, we have prepared a table of responses to each comment, which is uploaded with the revised manuscript.

I look forward to your advice.

Kind regards,

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18 January 2019

ECC-2018-0400_R1 Psychosocial predictors of hope two years after diagnosis of colorectal cancer: implications for nurse-led hope programs

Thank you to the reviewers for their comments on the manuscript. Changes have been marked in the manuscript (main document file) using blue text.

Reviewer comment	Response	Manuscript changes
Reviewer 1 The authors were thorough in their responses to previous comments. The paper has improved for the changes that they made.	Noted with thanks.	
Reviewer 2 The authors thoughtfully and thoroughly addressed most comments, and the manuscript is greatly improved.	Noted with thanks.	
Remaining comments are listed as follows:		
The authors write that the sociodemographic and disease characteristic variables were selected since they are related to quality of life and psychological outcomes in people with cancer. The manuscript would be stronger if cited previous literature showing these associations.	In our response to the reviewer in round 1, we indicated that we selected the sociodemographic and disease variables on the grounds that they are known to be related to quality of life and psychological outcomes in people with cancer. I can see that this response has confused the matter. The sociodemographic and disease variables are those usually used in this type of study to describe the sample. This allows comparability between studies. In regard to the selection of 'dummy' variables for the purpose of conducting the regression analyses, education, disease stage, smoking and alcohol were selected. While none of these variables were known to be associated with	See page 7 and reference list.

	hope, smoking has been associated with low levels of activity (Chambers et al., 2009), education has been associated with physical health-related quality of life (Weaver et al., 2012; Parker et al., 2003) and advanced disease is associated with lower quality of life (Ramsey et al., 2000). The relationship between alcohol use and health related quality of life is more uncertain (Ortola et al., 2016). These relationships are outlined in the methods section.	
Figures: the CONSORT diagram is helpful. It would be more useful if it included reasons why participants did not consent or did not provide follow-up data.	Noted with thanks. We agree that including reasons why participants did not consent or did not provide follow-up data would be helpful. However, this detailed information was not consistently collected and therefore not included.	No change.

Title

Psychosocial predictors of hope two years after diagnosis of colorectal cancer: implications for nurse-led hope programs

Abstract

Objective: To prospectively explore predictors of hope in people with colorectal cancer at 24 months postdiagnosis.

Methods: The present study is a secondary analysis of two waves within a longitudinal survey of patients newly diagnosed with colorectal cancer in Queensland, Australia. Baseline predictors (sociodemographic, disease, lifestyle characteristics, cancer threat appraisal, and quality of life domains) were measured via mailed surveys and telephone interviews at 6 months postdiagnosis. Hope was measured via mailed surveys at 24 months postdiagnosis.

Results: At 24 months postdiagnosis, 1265 participants completed the hope measure. Hope was predicted by higher education, physical activity, cancer threat appraisal, and each quality of life domain (i.e. physical, social, emotional and functional well-being; and colorectal cancer specific concerns), which explained 23.63% of the total variance in hope, $F(14, 1081) = 23.89$, $p<0.001$.

Conclusion: At 24 months postdiagnosis, hope was associated with greater functional, social, and emotional wellbeing, and less threatened cancer appraisals. As hope programs continue to be developed, designers should include activities that increase wellbeing and reduce cancer threat appraisal for people with colorectal cancer.

Key words: hope; colorectal cancer; quality of life; well-being

Introduction

Internationally, colorectal cancer is the third most common cancer in men and second in women (International Agency for Research on Cancer, 2012). In Australia, it is expected that colorectal cancer will become the second most diagnosed cancer overall in 2018 (Australian Institute of Health and Welfare [AIHW], 2017). With the five-year survival rate estimated at 69% compared to the general population (AIHW, 2017), the perceptions of people diagnosed with colorectal cancer regarding their future should be included as part nursing assessment in order to offer supportive interventions that can modify maladaptive perceptions. Nurse-led programs to promote hope are emerging as one way to modify maladaptive perceptions.

Hope is defined as "a positive motivational state that is based on an interactively derived sense of successful (a) agency (goal-directed energy) and (b) pathways (planning to meet goals)" (Snyder et al., 1991, p. 287). In a systematic literature review of hope in people living with cancer, hope is reported to enhance psychosocial adjustment (Chi, 2007), effective coping (Butt 2011; Vellone, Rega, Galletti, & Cohen, 2006), and quality of life (Esbensen, Osterlind & Hallberg, 2006; Li, Yang, Liu & Wang, 2016; Vellone et al., 2006). Nurse-led programs to support or transform hope in people with varying types and stages of cancer have been emerging since the turn of the century (Duggleby et al., 2016; Herth, 2001; Rustoen, Wiklund, Hanestad & Moum, 1998; Rustoen, Cooper & Miaskowski., 2010). These programs provide an opportunity to people living with cancer to learn more about themselves through structured activities. Greater understanding of what personal characteristics might influence hope can assist with hope program design.

Treatment for colorectal cancer involves a range of modalities, with significant physical and psychological effects. Surgical treatments for colorectal cancer can alter bowel function, lead to sexual difficulties, reduce participation in leisure activities and work, and

raise concerns about diet and appearance, such as clothing selection (Taylor, Bradshaw, Walker & Wood, 2013). For those who receive pelvic radiotherapy and chemotherapy, a constellation of symptoms can last for months to years (Taylor et al., 2013), and these physical bodily changes can be distressing (Sharpe et al., 2011; Nasvall et al., 2017). Many people living with colorectal cancer also experience psychological distress (Chambers et al., 2012), which has been associated with high cancer threat appraisal (Lynch, Steginga, Hawkes, Pakenham & Dunn, 2008).

High distress has also been associated with low levels of hope in several studies. Cross-sectional studies, conducted with people living with a range of cancer types, suggest that hope has a protective effect for psychological distress (Berendes et al., 2010; Liu, Griva, Lim, Tan, & Mahendran, 2017; Ripamonti, Miccinesi, Pessi, Di Pede & Ferrari, 2016; Rustøen et al., 2010). In a prospective study of 234 Chinese people living with colorectal cancer, people with chronic distress were found to be more likely to demonstrate loss of hope (Hou, Law, Yin & Fu, 2010). Another cross-sectional study of 51 people undergoing radiation and/or chemotherapy for lung cancer at Duke University Hospital in the USA, found hope was associated with lower psychological distress (Berendes et al., 2010). The relationship between distress and hope is consistent with the findings of a meta-analysis of qualitative hope studies (Hammer, Mogenson, & Hall, 2012).

Functional well-being, the ability to undertake fulfilling work, enjoy life, and feel content (Ward et al., 1999) is associated with hope in several cross-sectional studies. The first, a study of 137 outpatients receiving treatments in Taiwan hospitals, found that when the symptoms were distressing, such as tiredness and lack of appetite, both of which reduce enjoyment and contentment, hope was lower (Chang & Li, 2002). In a study of 214 Korean women with breast cancer, higher levels of hope were associated with perceived health status, which consisted of self-rating health and activity levels (Tae, Heitkemper & Kim, 2012). A

third study, of 240 Turkish patients undergoing chemotherapy as an outpatient, found that patients' feeling of improvement with the treatment and being able to do daily activities were associated with higher levels of hope (Kavradim, Ozer & Bozcuk, 2013).

The ability to sustain activities that were valued before the cancer diagnosis are also associated with hope. Qualitative studies that have demonstrated valued activities with hope include: 13 Canadians living with lymphedema associated with cancer (Hamilton & Thomas, 2016), 17 people with advanced cancer in Hong Kong (Mok et al., 2010), and 50 people treated for cancer in a London outpatient clinic (Sanatini, Schreir & Stitt, 2008). Each of these qualitative studies were conducted on people with different cancers and in different sites, suggesting that functional well-being may contribute to hope.

The percentage of people surviving to five years is expected to continue to rise with earlier detection, and improving treatments for, colorectal cancer. The research to date outlined above suggests that various facets of health and wellbeing, including functional wellbeing and distress, is related to greater hope. Identification of early characteristics associated with hope in the long-term, e.g. two years postdiagnosis, can provide guidance for nursing interventions in the post-diagnostic and early treatment phases of colorectal cancer. Accordingly, the aim of the current study is to explore whether early indicators of health and wellbeing (at 6 months postdiagnosis) are prospectively related to hope at two years postdiagnosis. Specifically, based on previous research, we hypothesise that healthier lifestyle characteristics, greater quality of life (functional wellbeing, emotional wellbeing, social wellbeing, and colorectal cancer-specific concerns) and less threatened cancer appraisals will predict hope at two years postdiagnosis.

Methods

This study provides a secondary analysis of data collected in a longitudinal research project on quality of life in colorectal cancer. Full details about recruitment for this project have been described in detail elsewhere (Lynch et al., 2007; Chambers et al., 2009). In brief, 2181 patients newly diagnosed with colorectal cancer were recruited from a population-based state cancer registry (63.7% consented) for the original longitudinal study. Eligibility criteria included a histologically confirmed diagnosis of primary colorectal cancer between 1 January 2003 and 31 December 2004; ability to speak and understand English language; no hearing, speech or cognitive disabilities; aged between 20 and 80 years; and resident of Queensland, Australia. Ethical approval for the project was obtained from the University of Queensland. A flow diagram of participation across timepoints from the original longitudinal research project is provided in Figure 1 for clarity. The sample for secondary analysis in this study was based upon participants who completed the hope measure at 24 months postdiagnosis (see Results section for further detail).

[insert figure 1 here]

Procedure and Measures

Baseline predictors for this study (sociodemographic, disease, lifestyle characteristics, cancer threat appraisal, and quality of life domains) were measured via mailed surveys and telephone interviews at 6 months postdiagnosis. Hope was measured via mailed surveys at 24 months postdiagnosis. In the original longitudinal study, hope was only measured once at this timepoint.

Sociodemographic variables. Standard sociodemographic variables were selected to describe the sample and included age, gender, education, marital status, tumour site, disease stage, and presence of ostomy.

Lifestyle characteristics. Participants answered items about current smoking status, alcohol consumption in the past month and physical activity. Items about physical activity were based upon a standard instrument used for the Australian population (Australian Institute of Health & Welfare, 2003; Booth, Owen, Bauman, & Gore, 1996a; Booth, Owen, Bauman, & Gore, 1996b). Items measured the number of minutes spent walking and engaging in moderate-intensity physical activity (e.g. gentle swimming, social tennis and golf) and vigorous-intensity physical activity (e.g. jogging, cycling, aerobics and competitive tennis) each week in the past month. As per recommendations set out by the Australian Institute of Health & Welfare (2003), minutes spent on vigorous-intensity physical activity were double weighted. Minutes from all categories were summed to create a total score.

Cancer threat appraisal. The Constructed Meaning Scale (Fife, 1995) measured cancer threat appraisal. This scale contains eight items that measure on a 4-point Likert scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*) the degree to which colorectal cancer has affected perceptions of identity, interpersonal relationships and the perceived future (Fife, 1995). There are questions about perceptions and feelings tied to the illness (Fife,1995). For example, "I feel like an outsider due to my illness". All items were summed with lower scores indicating negative, more threatened appraisals. Internal consistency was good (α=.79), meeting the recommended cut-off for acceptable internal consistency of Cronbach's alpha >0.7 (Nunnally, 1978). The instrument has both content and construct validity (Fife, 1995).

Quality of life domains. The Functional Assessment of Cancer Therapy – Colorectal Cancer (FACT-C: Ward et al., 1999) was used to measure physical, social, emotional, and functional well-being and colorectal cancer-specific concerns. Each domain contains six to seven items. Examples of items include "I am able to work (including work in the home)" [functional well-being], "I have a lack of energy" [physical well-being], "I get emotional

support from my family" [social/family well-being], "I am proud of how I'm coping with my illness" [emotional well-being], and "I have swelling or cramping in my stomach area [colorectal cancer specific concerns] (Ward et al., 1999). All items were responded to on a 5-point Likert scale ranging from 0 (*not at all*) to 4 (*very much*). Items for each domain were summed with higher scores indicating greater quality of life in that domain. Internal consistency ranged from moderate to very good across domains (physical α=.84, social α=.73, emotional α=.76, and functional well-being α =.84, colorectal cancer-specific concerns α =.62). FACT-C has been found to be a valid and reliable measure of quality of life in colorectal cancer patients and sensitive to changes in functional status (Ward et al., 1999).

Hope. The 8-item Adult Trait Hope Scale was used to measure perceptions of agency and pathways in relation to meeting goals (Snyder et al., 1991). Items were responded to on an 8-point Likert scale ranging from 1 (*definitely false*) to 8 (*definitely true*). Example items include: "I energetically pursue my goals" and "There are lots of ways around any problem" (Synder et al., 1991). The scale has been found to have convergent and discriminant validity (Synder et al., 1991). All items were summed with higher scores indicating stronger perceptions of hope. Internal consistency was high (α=.89).

Data Analysis

Only fully completed surveys were included in the analysis. Initial descriptive analyses included means, standard deviations, and frequencies. The selection of categorical independent variables was based on evidence of relationships between education and physical health related quality of life (Parker, Baile, de Moor & Cohen, 2003; Weaver et al., 2012), advanced disease and lower quality of life (Ramsey et al., 2000), and smoking and lower levels of activity (Chambers et al., 2009). Alcohol use has also been investigated in relation to health-related quality of life, with less uncertain conclusions (Ortolá et al., 2016). The categorical independent variables that were recoded as dummy variables prior to correlation

and regression analyses included: education (1 undergraduate university degree or above, 0 technical college or lower); disease stage (1 disease stage 3 or above, 0 disease stage 2 or lower); smoking (1 currently smoking at least one cigarette per day, 0 not currently smoking); and alcohol (1 at least one alcoholic drink in past month, 0 no alcohol in past month). Pairwise Pearson's correlation coefficients for main analysis variables were examined. A hierarchical regression predicting hope, the dependent variable, was undertaken with independent variables entered in the following order: step 1) sociodemographic characteristics (age, education, marital status); step 2) disease characteristics (time since diagnosis, disease stage); step 3) lifestyle characteristics (smoking, alcohol, physical activity); step 4) cancer threat appraisal; and step 5) quality of life domains (physical well-being, social well-being, emotional, and functional well-being and colorectal cancer-specific concerns). Data screening, regression diagnostics, and analyses were conducted using Stata (Version 14). Data were inspected for multivariate outliers using mahalanobis distance scores and visual inspection of regression post-estimation plots. The algorithm, Blocked Adaptive Computationally-Efficient Outlier Nominators (BACON; Billor, Hadi, & Velleman, 2000), detected no variables with extreme mahalanobis distance scores. No other extreme violations were noted, including normality and multicollinearity. Missing data were handled with listwise deletion. Statistical tests for correlation and regression analyses were two-tailed with a significance level of 5%.

Results

At 24 months post-diagnosis, 1265 participants completed the hope measure via self-administered questionnaire (58% retention). Baseline characteristics for this sample, which is the focus on the current study, are reported in Table 1. For interested readers, baseline sample characteristics for the full sample have been reported elsewhere (Lynch et al., 2007).

[Insert Table 1 around here]

Correlations between Hope and Independent Variables

Descriptive data and correlations between main study variables are reported in Table 2. Hope, the main outcome variable, was significantly correlated with the following variables: higher education, physical activity, cancer threat appraisal, and each quality of life domain (i.e. physical, social, emotional, and functional well-being; and colorectal cancer-specific concerns).

[Insert Table 2 around here]

Factors influencing hope

At step 1, the model with sociodemographic characteristics was significant and accounted for 1.42% of the explained variance in hope, $F(3, 1261) = 6.06$, $p<0.001$. The addition of disease characteristics did not significantly increase the explained variance at step 2, $F(2, 1130) = -0.34$, $p=1.00$. The model remained significant at this step and accounted for 1.52% variance overall, $F(5, 1130) = 3.50$, $p<0.01$. At step 3, the addition of lifestyle characteristics significantly increased the explained variance by 1.20%, $F(3, 1127) = 4.53$, $p<0.01$. The model was significant at this step, $F(8, 1127) = 3.90$, $p<0.001$. At step 4, the addition of cancer threat appraisal significantly increased the variance explained by 10.80%, $F(1, 1086) = 134.45$, $p<0.001$. The model remained significant at this step with a total of 13.49% of variance explained in hope, $F(9, 1086) = 18.82$, $p<0.001$. At step 5, the addition of quality of life domains significantly increased the variance explained by 10.10%, $F(5, 1081) = 28.69$, $p<0.001$. At this final step, the model was significant and explained 23.63% of the

variance in hope, $F(14, 1081) = 23.89$, $p<0.001$. The significance of each predictor at each step is reported in Table 3. At the final step, the strongest predictor of hope was functional well-being followed by less threatened cancer appraisals, emotional well-being, social well-being, and higher education.

[Insert Table 3 around here]

Discussion

In this study, predictors for hope in people with colorectal cancer included functional well-being, how the person thinks about, or appraises, their condition and, to a lesser extent, social and emotional well-being. Functional well-being, the ability to continue meaningful work, sleeping well, and enjoying the things usually done for fun (Ward et al., 1999), is important within the context of medical treatments that can pose significant physical changes to the body (Taylor et al., 2013). This finding is consistent with cross-sectional studies showing an association between functional well-being and higher levels of hope (Chang & Li, 2002; Tae et al., 2012; Kavradim et al., 2013). Qualitative studies of hope in people with colorectal cancer suggest that hope was threatened by the infringement of disease on body integrity (Ramfelt et al., 2002), and a desire to return to normalcy was dominant (Beckman et al., 2013). Whether this association is due to colorectal cancer or the physical changes associated with colorectal cancer bears further investigation. For example, people living with lymphoedema, a disease that also has significant physical changes, also report a strong desire to return to normal (Hamilton & Thomas, 2016).

Individuals with a positive perception of the cancer illness, such as believing recovery from the cancer is likely, feeling like a recovery is possible, and managing the uncertainty of

the illness (Fife, 1991) experienced higher levels of hope two years later. How people perceive their illness is potentially modifiable (Lynch et al., 2008).

Social and emotional well-being was also found to predict hope, albeit to a lesser extent. Feeling supported by friends and family, remaining close to a partner, and lower feelings of sadness, worry or anxiety (Ward et al., 1999) were important. This is consistent with cross-sectional studies where hope was associated with positive perceptions of social support (Crothers, Tomter & Garske, 2005; Khater & Alkwiese, 2013; Vellone et al., 2006). How people with colorectal cancer perceive their disease is complex, with often competing biopsychosocial, contextual and cultural influences on how people interpret and act on their symptoms (Hall et al., 2015). In particular, the stigma of colorectal cancer and the 'private nature' of colorectal cancer symptoms could affect how people with colorectal cancer access (or not) resources (Hall et al., 2015). People with colorectal cancer may benefit from hope programs focused on functional wellbeing, perceptions of the illness experience, and socio-emotional wellbeing.

We also found a relationship between a higher level of education and hope. This finding has implications for further consideration. Firstly, it may be that interventions aimed at increasing hope may work better for those who are more educated. Secondly, health professionals are challenged to carefully consider how to help patients who are less educated to develop greater hope.

Strengths and limitations

This study had several limitations. First, the available data did not include hope at baseline. Baseline hope data would have helped to clarify the associations between hope and other factors at multiple time points on the illness trajectory. Second, while the descriptive correlational design can show a relationship, it does not prove causation (Polit & Beck,

2017). Third, the findings of this study would be strengthened with comparison to a matched cohort, who are living with another chronic life-limiting disease, to determine whether the relationship between hope and functional, social and emotional wellbeing and illness (cancer or other illness) threat appraisal is unique to people living with colorectal cancer or a more universal experience of illness. Fourth, the study will have some selection bias, where those who respond to the surveys may not be representative of the entire population (Polit & Beck, 2017). Related to this, there is no data provided on ethnicity or race nor have we done an analysis to determine whether participants who were lost to follow up differed from participants who completed the 24-month follow up. However, the strength of this research is the population design, this is the largest survey of people living with colorectal cancer. The measures used to assess cancer threat appraisal and the quality of life domains are widely used scales, enhancing the internal validity of the findings and facilitating comparison with other studies.

Fifth, the diagnosis for the population in this study were predominantly stage II or III colorectal cancer, accounting for 59% of the sample. There was no association between disease stage at diagnosis and hope two years later. A very small proportion (3.67%) were stage IV at the time of diagnosis therefore it is important to note that these findings may not be relevant for this group.

Finally, we recognise that the 1991 Hope Scale (Synder et al., 1991) used in this study measures 'trait' hope, general or characteristic level of hope across situations, rather than 'state' hope, which fluctuates in response to life circumstances. In the discussion of our findings, we have treated hope as a 'state' (modifiable) construct. Snyder suggests that while hope can be considered a dispositional or trait concept, it "is possible to change dispositional hope over time (e.g. through counselling)." (Snyder 1995, p355). While this research

confirms Snyder's (1995) view that hope is modifiable, we recommend that future studies use the 'state' version of the Hope Scale (Snyder et al., 1996).

Implications for nursing

The finding that hope was strongly associated with functional wellbeing suggests that a key nursing intervention is to clarify the patient's goals, particularly in relation to what they want to do. Second, it is important for nurses to differentiate positive affect from being hopeful. While an individual can appear positive and hopeful, investigation of individual's goals can reveal deeply held fears about not returning to 'normal' and identification of person-focused strategies that can foster hope.

Hope programs for people living with cancer are emerging as a nursing-led strategy to support hope. The living with hope program (Herth, 1991) has been developed to target people newly diagnosed with cancer in Norway (Rustoen et al., 1998), community dwelling people living with cancer in Norway (Rustoen et al., 2011), and in an online version for women survivors of childhood cancer (Cantrell & Conte, 2008). Iranian hope programs focus on spiritual group therapy (Rafsanjani, Arab, Ravari, Miri, Safarpour, 2017) and a supportive-expressive discussion (Tabrizi, Radfar, Taei, 2016). Based on the findings of this study, activities addressing functional, social and emotional well-being as well as strategies to modify cancer threat appraisal should be included for sustained hope. The Hope Intervention Program (Herth, 2001; Rustoen et al., 1998; Rustoen et al., 2011) and the supportive expressive discussion groups (Tabrizi et al., 2016) appear to address these areas.

Hope intervention programs are not yet widespread in practice. Given the contribution of functional well-being to variance in this study, nurses working in areas without an established hope program could focus their psychosocial interventions on promoting and preserving patients' functional well-being as a way of intervening to promote

hope. For example, directing patients to programs that help people to remain in, or return to, work, to engage in activities that they enjoy, and to promote sleep hygiene.

This study has identified important elements of hope for people with colorectal cancer. Whether these concerns are important for people living with other, less stigmatised cancers, or living with cancer in countries with different cultures, bears further investigation. The majority of participants in this study had stage II or III disease, with less than 5% in stage IV. We suggest that people in this study were more likely to be living with a fear of reoccurrence, of another surgery, of an ostomy, or other physical changes that could be debilitating. However, further research is required to determine whether the focus on functional wellbeing is limited to people living with colorectal cancer, or living with cancer with significant physical changes, or living with cancer that is considered life-limiting.

As noted in the limitations, hope was measured as a trait, rather than state, in this study. While measuring hope as a trait may suggest limited modifiability of hope as an outcome, we would counter that further research into hope as a state or trait is required. Importantly, differentiating state hope from trait-based hope will continue to be important for research in this area. Careful selection of a state or trait hope instrument to measure hope is recommended in future studies.

Conclusion

The findings of this study suggest that for people with colorectal cancer, functional well-being and low cancer threat appraisal can predict hope. Colorectal cancer is a common cancer in Australia and other countries. Further research into interventions that promote functional well-being and reduce cancer threat appraisal in people diagnosed with colorectal cancer is merited. Cancer nurses caring for people with colorectal cancer should assess perceptions of functional well-being early in the cancer journey and follow these up as bodily

changes occur in relation to cancer treatment and/or disease progression. Also, cancer nurses can assess for cancer threat appraisal at around six months post-diagnosis to identify individuals who may require specialist psychological care.

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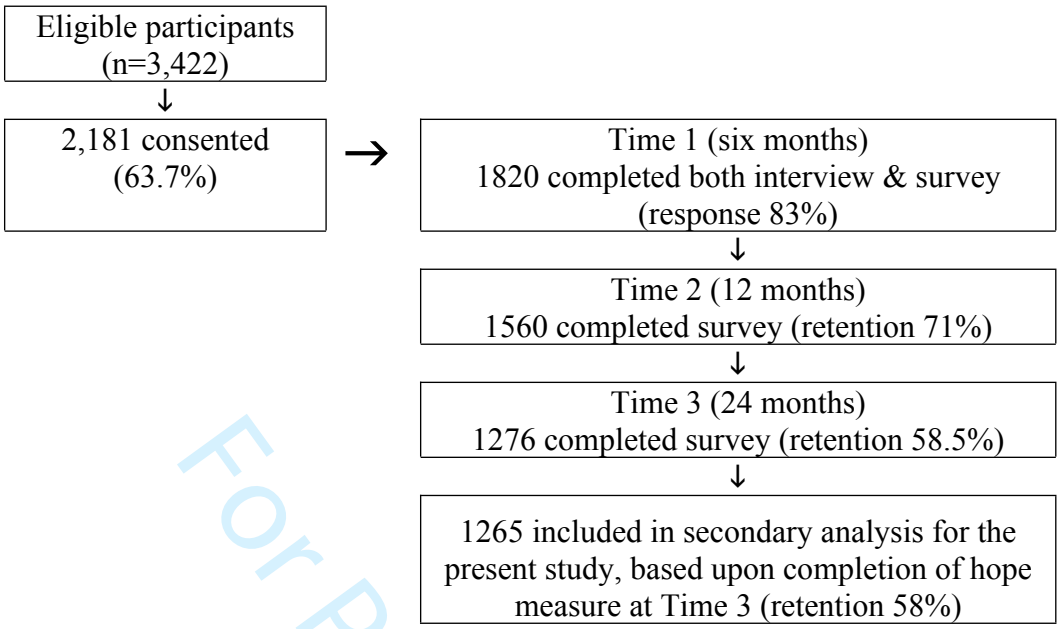

Figure 1. Flowchart of completed surveys at each time point for the original longitudinal study (derived from Chambers et al., 2009; Lynch et al., 2007).

Table 1

Characteristics of sample (*n*=1265)

Characteristic	
Age	65.20 years (10.13 years)
Gender	
Male	58.18%
Female	41.82%
Education	
<8 years	12.49%
8-11 years	40.24%
12 years (completed high school)	10.28%
Technical college	23.00%
University	13.99%
Marital status	
Never married	4.03%
Married/de facto	75.26%
Widowed	10.99%
Divorced, separated	9.72%
Site of tumour	
Colon	63.24%
Rectal	36.76%
Stage of disease	
Stage 0	1.27%
Stage I	26.22%
Stage II	32.43%
Stage III	26.93%
Stage IV	3.67%
Unknown	9.48%
Treatment received	
Surgical removal of cancer	97.31%
Chemotherapy	39.13%
Radiotherapy	10.99%
Pouch outside bowel	
Yes, permanent	5.38%
Yes, temporary	11.62%
No	83.00%
Smoking status	
Current smoker	7.27%
Former smoker	53.52%
Never smoked	39.21%
At least one alcoholic drink in past month	67.43%
Physical activity	
Inactive (0 minutes per week)	33.52%
Insufficiently active (1-149 minutes per week)	26.96%
Sufficiently active (>150 minutes per week)	39.53%

Note. For continuous variables, values in parentheses are standard deviations.

Table 2

Descriptive statistics and correlations between main analysis variables

Variable	M(SD)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Hope	24.95 (3.76)															
2. Age	65.20 (10.13)	.03														
3. Education[a]		.11**	-.06*													
4. Marital status[a]		.00	-.12**	.05												
5. Time since diagnosis	19.98 (11.29)	-.03	.05	-.04	-.05											
6. Disease stage[a]		.01	-.04	.01	.06	-.03										
7. Smoking[a]		-.04	-.11**	-.03	-.09*	-.02	-.08*									
8. Alcohol[a]		.05	-.07*	.02	.06*	-.02	-.04	.05								
9. Physical activity	182.01 (293.30)	.11**	-.02	.11**	.01	.00	-.03	-.05	.10**							
10. Cancer threat appraisal	24.91 (4.21)	.35**	.04	.00	.01	-.03	-.07*	-.05	.03	.11**						
11. Physical wellbeing	25.58 (3.81)	.23**	.22**	.04	-.02	.05	-.18**	-.02	.10**	.11**	.30**					
12. Social wellbeing	23.30 (4.35)	.26**	.01	-.01	.10	-.01	.03	-.03	.01	-.03	.25**	.10**				
13. Emotional wellbeing	21.86 (3.00)	.33**	.23**	.04	.05	-.00	-.03	-.05	.05	.10**	.43**	.47**	.21**			
14. Functional wellbeing	23.02 (4.87)	.41**	.10**	.05	.03	.02	-.07*	-.06*	.10*	.17**	.48**	.57**	.37**	.54**		
15. Colorectal cancer-specific concerns	23.54 (3.67)	.28**	.11**	.02	.04	.05	-.07*	-.09*	.09**	.14**	.32**	.55**	.22**	.37**	.58**	

[a]Dummy variable.

Table 3

Hierarchical regression predicting hope

Variables	B	SE	β
Step 1			
Age	0.01	0.01	0.04
Education	1.26	0.30	0.12**
Marital status	-0.04	0.25	0.00
Step 2			
Age	0.01	0.01	0.04
Education	1.24	0.33	0.11**
Marital status	-0.13	0.26	-0.02
Time since diagnosis	-0.01	0.01	-0.03
Advanced disease	0.12	0.23	0.15
Step 3			
Age	0.01	0.01	0.03
Education	1.11	0.33	0.10**
Marital status	-0.20	0.26	-0.02
Time since diagnosis	-0.01	0.01	-0.03
Advanced disease	0.13	0.24	0.02
Smoking	-0.59	0.44	-0.04
Alcohol	0.34	0.24	0.04
Physical activity	0.00	0.00	0.09*
Step 4			
Age	0.01	0.01	0.03
Education	1.08	0.31	0.10**
Marital status	-0.22	0.25	-0.02
Time since diagnosis	-0.01	0.01	-0.02
Advanced disease	0.28	0.23	0.04
Smoking	-0.42	0.43	-0.03
Alcohol	0.37	0.23	0.05
Physical activity	0.00	0.00	0.06*
Cancer threat appraisal	0.30	0.03	0.33**
Step 5			
Age	-0.01	0.01	-0.01
Education	0.86	0.30	0.08*
Marital status	-0.37	0.24	-0.04
Time since diagnosis	-0.01	0.01	-0.03
Advanced disease	0.30	0.22	0.04
Smoking	-0.14	0.40	-0.01
Alcohol	0.12	0.22	0.02
Physical activity	0.00	0.00	0.03
Cancer threat appraisal	0.13	0.03	0.14**
Physical well-being	-0.02	0.03	-0.02
Social well-being	0.07	0.02	0.09*
Emotional well-being	0.14	0.04	0.11**
Functional well-being	0.17	0.03	0.24**
Colorectal cancer-specific concerns	0.05	0.03	0.06

*p<0.05. **p<0.001