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# Health-related quality of life in cancer survivorship: predictive power of the Social Difficulties Inventory

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## Introduction

A significant minority of cancer survivors experience long-term compromised health-related quality of life (HRQoL).<sup>1</sup> As the number of survivors increases, a key challenge is identifying which patients may experience ongoing HRQoL difficulties, in order to effectively target the provision of finite support services, and potentially facilitate a risk-stratified approach to follow-up care.<sup>2,3</sup> Identifying patients at risk of reduced HRQoL in survivorship requires psychometrically sound screening measures with good predictive power.

The Social Difficulties Inventory (SDI-21) is a measure of everyday social problems (e.g. with activities of daily living, work, relationships) developed for use in routine cancer practice.<sup>4</sup> It contains 21 items (e.g. have you felt isolated, had any financial difficulties) rated from 0 (no difficulty) to 3 (very much) with respect to the past month. The SDI-21 was highlighted as offering potential as a screening measure in the National Cancer Survivorship Initiative Vision document,<sup>5</sup> and is being used in a screening program in Canada as part of the Distress Assessment and Response Tool which is completed by patients before oncology

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consultations, and a results summary flagging moderate to high distress responses is sent in real-time to patients' e-records for discussion in the consultation.<sup>6</sup> However, to be useful in screening the SDI-21 must be able to predict HRQoL at a later time-point. Using secondary data analysis, this paper examines the predictive power of the SDI-21.

## **Materials and Methods**

### **Participants and procedure**

This paper uses data from the electronic Patient-reported Outcomes from Cancer Survivors (ePOCS) study.<sup>7</sup> The study received National Health Service ethical approval (Leeds(East)REC:10/H1306/65). Patients diagnosed with potentially curable breast, colorectal or prostate cancer, recruited from hospitals in England, completed various HRQoL questionnaires online at three time-points: at study consent within six months of diagnosis (T1), and nine (T2) and fifteen (T3) months post-diagnosis. A subset of these questionnaires are analysed here.

### **Measures**

#### **T1: Sociodemographic and clinical information**

Diagnosis, gender, age and postcode (for deriving socioeconomic status using the Index of Multiple Deprivation<sup>8</sup> (IMD)) were collected from clinical records. Ethnicity, relationship status, and education were self-reported.

#### **T2: Social Difficulties Inventory (SDI-21)**

The SDI-21 comprises three subscales (Everyday-living, Money-matters, Self-and-others), which when added together form a 16-item summary score of general social distress (SD-16), and 5 single items.<sup>9</sup> SD-16 scores range from 0 to 44 (higher scores=greater difficulties),

with a recommended cut-point of  $\geq 10$  indicating a clinically significant level of social distress warranting discussion with the patient.<sup>10</sup>

T3: Medical Outcomes Study 36-item Short-Form Health Survey, version 2 (SF-36v2)

The SF-36v2 is an internationally used, psychometrically sound measure of HRQoL for the general population.<sup>11</sup> It yields physical (PCS) and mental (MCS) component summary measures with norm-based scoring (mean=50; SD=10; lower scores indicate lower HRQoL and  $< 50$ =below average).

### Analysis

Two hierarchical linear regression analyses were undertaken, with PCS and MCS scores as dependent variables and social distress a binary predictor variable (using the SD-16  $\geq 10$  cut-point) (Table 2). Analyses of Relative Risk were undertaken by dichotomising participants into groups of socially distressed and not (using the SD-16  $\geq 10$  cut-point) and higher and lower PCS and MCS scores (lower scores being  $> 1$ SD below the normative mean score; i.e.  $< 40$ ). Analyses were performed using IBM-SPSS version-21.

## Results

### Participants

Of 1,152 invited patients 636 (55.21%) consented to participate in the ePOCS study, and 357 of these provided SD-16 and SF-36v2 data at T2 and T3 respectively. The characteristics of this sample are summarised in Table 1.

## SD-16, PCS and MCS scores

SD-16 scores (M=4.12; SD=5.52) were skewed with most participants experiencing little or no social distress; only 46/357 (12.9%) participants scored at or above the SD-16 cut-point. Mean PCS (M=47.60; SD=9.92) and MCS (M=49.54; SD=10.87) scores were just below, but close to, the normative average. The proportion of participants obtaining lower HRQoL scores (i.e. >1SD below the normative average) was 77/357 (21.6%) for the PCS, 70/357 (19.6%) for the MCS, 115/357 (32.2%) for either the PCS or MCS, and 32/357 (9.0%) for both the PCS and MCS.

## Predictive value of SD-16 social distress scores on HRQoL six months later

The results of the regression analyses are summarised in Table 2. For physical HRQoL, the overall model at step 1 was significant ( $F(5,351)=7.480, p<.001$ ) and explained 9.6% of the variance in PCS scores. Including SD-16 scores at step 2 improved the predictive power of the model ( $F(6,350)=19.791, p<.001$ ), which explained an additional 15.7% of the variance in PCS scores (25.3% in total). In the two-step model social distress was the strongest predictor of poorer physical HRQoL, with (older) age being the only other significant predictor. For mental HRQoL, the overall model at step 1 was significant ( $F(5,351)=6.829, p<.001$ ) and explained 8.9% of the variance in MCS scores. Including SD-16 scores improved the predictive power of the model ( $F(6,350)=17.224, p<.001$ ), which explained an additional 13.9% of the variance (22.8% in total). In the two-step model social distress was the only significant predictor of poorer mental HRQoL.

## Relative Risk (RR)

The RR (unadjusted for other variables) of participants in the socially distressed group having poorer HRQoL six months later, compared with those scoring below the SD-16 cut-point,

was 3.45 (95%CI:2.41-4.92) for PCS; 4.78 (95%CI:3.33-6.86) for MCS; 3.21 (95%CI:2.52-4.07) for either PCS or MCS; and 8.69 (95%CI:4.65-16.26) for both PCS and MCS.

## **Discussion**

This paper shows that the SD-16 summary score from the SDI-21 nine months post-diagnosis was a significant independent predictor of HRQoL at fifteen months post-diagnosis. The relative risk of having poorer HRQoL six months after scoring above the SD-16 cut-off was considerable. Where the SDI-21 is being used in Canada as part of an assessment tool in routine cancer care, the Everyday-living subscale has been found to be a significant correlate of suicidal intention.<sup>12</sup> Our novel analyses now indicate that the SD-16 is able to predict longer-term HRQoL among cancer survivors.

These secondary analyses must, however, be considered exploratory and the findings preliminary. Though not inconsiderable, the proportion of variance in HRQoL accounted for by SD-16 scores was modest (approximately 15%), and may have been lower still had we controlled for more other variables (step 1). Administration of the SDI-21 at nine months post-diagnosis was a proxy only for the time of transition from active treatment to follow-up, when survivorship assessment and care planning may take place. Consenting patients in the ePOCS study were younger and living in more affluent areas than those who declined participation.<sup>7</sup> Furthermore, data for this paper were available for just 56.13% of the total ePOCS sample. Future research should address these sample biases and examine the predictive power of the SDI-16 over longer time periods. It would also be interesting to explore if the predictive power of the SD-16 varies by cancer type.

Our findings are encouraging regarding the usefulness of the SDI-16 to help predict future risk of lower HRQoL. If further work is corroborative, the SDI-16 could prove useful

as a component of screening tools to facilitate risk-stratified follow-up care for cancer survivors.

#### **Key points**

- It is important to identify patients at risk of lower HRQoL in survivorship
- We examined the predictive power of the Social Difficulties Inventory (SDI-21) – specifically the SD-16 social distress summary score
- Cancer patients completed the SDI-21 nine months post-diagnosis and a HRQoL measure 6 months later
- SDI-16 scores were a significant predictor of physical and mental HRQoL
- The relative risk of poorer HRQoL six months after scoring above the SDI-16 cut-off was considerable

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**Table 1.** Sociodemographic and clinical sample characteristics

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<i>Gender</i>	
Male	162(45.4%)
Female	195(54.6%)
<i>Age years, M±SD</i>	
	60.82±10.47
<i>Socioeconomic status</i>	
1 (most deprived quintile)	51(14.3%)
2	65(18.2%)
3	55(15.4%)
4	97(27.2%)
5 (least deprived quintile)	89(24.9%)
<i>Ethnicity</i>	
Caucasian	347(97.2%)
Non-Caucasian	1(0.3%)
Non-response	9(2.5%)
<i>Relationship status</i>	
Married	254(71.1%)
Civil partnership	1(0.3%)
In a relationship	32(9.0%)
Divorced/separated	18(5.0%)
Single	17(4.8%)
Widowed	26(7.3%)
Non-response	9(2.5%)
<i>Education</i>	
No formal qualifications	64(17.9%)
High school	70(19.6%)
Further education	68(19.0%)
University	75(21.0%)
Other	64(17.9%)
Non-response	16(4.5%)
<i>Cancer diagnosis</i>	
Breast	163(45.7%)
Colorectal	96(26.9%)
Prostate	98(27.5%)

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**Table 2.** Summary of the regression analyses for HRQoL

	R	R <sup>2</sup>	R <sup>2</sup> <sub>adj</sub>	ΔR <sup>2</sup>	B (Unstandardised)	Standard Error	β (Standardised)	t
<b>Physical HRQoL</b>								
<i>Step 1</i>								
Age	.310	.096	.083	.096	-.235	.053	-.249	-4.421***
IMD score					.000	.000	.170	3.326**
Gender					-.485	2.013	-.024	-.241
Cancer diagnosis <sup>a</sup>					.749	1.795	.034	.417
Cancer diagnosis <sup>b</sup>					4.686	2.338	.211	2.004*
<i>Step 2</i>								
Age	.503	.253	.241	.157	-.312	.049	-.329	-6.330***
IMD score					9.558E-5	.000	.087	1.819
Gender					-.126	1.833	-.006	-.069
Cancer diagnosis <sup>a</sup>					.576	1.634	.026	.352
Cancer diagnosis <sup>b</sup>					4.097	2.130	.185	1.924
Social distress					-12.275	1.431	-.415	-8.579***
<b>Mental HRQoL</b>								
<i>Step 1</i>								
Age	.298	.089	.076	.089	.156	.059	.150	2.665**
IMD score					.000	.000	.169	3.296**
Gender					-1.504	2.217	-.069	-.678
Cancer diagnosis <sup>a</sup>					3.030	1.977	.124	1.533
Cancer diagnosis <sup>b</sup>					4.497	2.575	.185	1.746
<i>Step 2</i>								
Age	.477	.228	.215	.139	.077	.055	.074	1.405
IMD score					.000	.000	.091	1.873
Gender					-1.133	2.044	-.052	-.554
Cancer diagnosis <sup>a</sup>					2.851	1.822	.116	1.565
Cancer diagnosis <sup>b</sup>					3.888	2.375	.160	1.637
Social distress					-12.677	1.595	-.391	-7.947***

HRQoL=health-related quality of life; IMD=Index of Multiple Deprivation; \*p<.05; \*\* p<.01; \*\*\* p<.001

Age and IMD score are continuous variables, gender (1=male, 0=female), cancer diagnosis (a = 1=colorectal, 0=breast or prostate) (b = 1=prostate, 0=breast or colorectal) and social distress (1=socially distressed, 0=not) are nonmetric variables using dummy coding