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Does marital status and altered contact with the social network predict colorectal cancer survival?

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ABSTRACT

We examined whether changes in the frequency of contact with the social network (partner, children, grandchildren, other relatives, friends and colleagues) in a group of colorectal cancer patients were associated with survival. The study was based on a questionnaire survey from 1991. The study population consisted of 770 Danish colorectal cancer patients diagnosed in the period 1985–1990, and followed up for survival until March 2002. Using Cox regression analysis we found a significantly higher mortality among patients who had lost their partner before the operation compared to patients cohabiting with the same partner as before the operation (rate ratio (RR) = 1.4, 95% confidence interval (CI): 1.1–1.8) possibly because of less active cancer treatment. This needs investigation in future studies. Contrary to expectations we also found a significantly higher mortality among patients reporting increased contact with their children compared to patients reporting unchanged contact frequency (RR = 1.7, 95% CI: 1.3–2.4). However, a low physical functioning of the cancer patient may have confounded the latter result.

1. Introduction

The social network including strong relations to family, friends and significant others has been associated with mortality in several studies showing that individuals with a well functioning social network have a decreased mortality.[1–6] It is observed that these individuals recover faster and survive longer compared to individuals with a less well functioning social network.[7–11] This relation between social network and mortality is well documented for cardiovascular diseases. However, there is limited evidence of an association between the social network and survival after cancer. Being socially isolated has been associated with lower survival among cancer patients[12] and the presence of one or more confidants in the cancer patient's social network may have a protective effect on survival.[13] One of the most important persons in the cancer patient's social network is the partner and married cancer patients seem to have considerably better survival than unmarried cancer patients.[11,14,15] However, the opposite effect of marriage has also been found but only in breast cancer patients.[16]

There are few studies concerning changes in the interaction with the social network. Descriptive studies among older people indicate that although the size of the social network and the contact frequency often decrease over time, the provision of emotional support remains the same.[17,18] Other studies show no changes in the contact with close relations, indicating that ageing does not necessarily cause decreased social resources.[19] However, changes in the interaction with the social network might be of particular importance among persons with a severe disease such as cancer, because of a possible increase in the need for support. Whether these

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changes are of any significance to survival of cancer patients is unclear. The purpose of the present study was therefore to examine whether changes in the extent of contact with the social network in a group of colorectal cancer patients were associated with survival after cancer surgery.

2. Patients and methods

2.1. Study population

The study was based on a previous cross-sectional survey from 1991 of 848 Danish colorectal cancer patients.[20] Patients included in the study were identified in the Danish Cancer Registry. The Danish Cancer Registry began reporting cancer incidence on a nationwide scale in 1943. Each record includes the personal identification number, date of diagnosis of the tumour and information on the tumour.[21] The Civil Registration System was established in Denmark on 1 April 1968. Since then, all Danish residents have been assigned a ten-digit personal identification number that incorporates information on sex and date of birth and permits accurate linkage of information among registries.

In 1991 we identified 6341 patients in the Danish Cancer Registry. The patients were between 18 and 80 years of age, lived in Denmark (not the Faroe Islands or Greenland) and were diagnosed with colorectal cancer in the period 1 July 1985 to 30 June 1990. The malignancies of interest were coded according to the International Classification of Diseases, Seventh Revision as colon cancer (ICD-7 153.0), colon sigmoidei and rectosigmoidei (ICD-7 153.3) and rectum cancer (ICD-7 154.0).

With the use of the personal identification number we were able to obtain information on the patients' vital status in 1991 by linkage with the Civil Registration System. This left us with 3311 colorectal cancer patients who were still alive in 1991 and thus had survived up to 6 years after their diagnosis and abdominal surgery. A total of 1511 of these patients were randomly sampled. During the review of hospital records, which provided complete information on clinical and pathological characteristics such as Dukes' staging, metastases and local recurrence, 101 patients were excluded because they had had endoscopic treatment of their disease. Of the remaining 1410 patients, 190 were excluded because the hospital departments refused contact, and 108 died during the interview period, leaving 1112 patients available for telephone interview. Of these, 172 (15%) refused an interview, 80 (7%) did not respond and 11 (1%) had no telephone, leaving 849 patients (76%) who were interviewed in 1991. Following the telephone interview, which was conducted by trained interviewers from the Danish Cancer Society, one patient was excluded because of endoscopic treatment. A total of 848 patients completed the questionnaire in 1991 and were included in the original study. The questionnaire used for the interview contained questions on social network, social support and socioeconomic factors, information received at the time of the diagnosis and reactions to this information, treatment, dietary and smoking habits, self-rated health, sexuality, psychic vulnerability, fatigue and coping potential.

The present study evaluated differences in survival after the primary operation. For 78 patients, the date of the operation was not available from the hospital records. These patients were not included in the present study, which left 770 patients. These patients were followed from the date of the interview until death or 21 March 2002, whichever came first.

2.2. Measurements

In the present study, we used information concerning the patients' social network. The social network was defined as the presence of informal social relations with a partner, children, grandchildren, other relatives, friends or colleagues whom the patients meet in their leisure time. Patients were asked about the contact frequency with these relations and changes in contact frequency after cancer surgery (for example: do you see your children more or less often after the operation compared to earlier?). The answers to the latter question divided the patients into four categories concerning children, grandchildren, other relatives, friends or colleagues: patients without the relation concerned, patients with a decreased contact, patients with an unaltered contact, and patients with an increased contact with the social network after cancer surgery. The answers concerning the partner categorised the relations with the partner as follows: the patient had the same partner as before the operation, had changed partner since the operation, had found a partner since the operation, had lost the partner before the operation (by divorce or the partner's death), had lost the partner after the operation, or the patient had never had a partner.

2.3. Analyses

The association between social network and all-cause mortality was evaluated using Cox's proportional hazards regression model with time since the primary operation as the time axis to ensure that the estimation procedure was based on comparisons of patients who had survived the same number of days after the primary operation. The analyses were corrected for delayed entry, that is, the patients were not considered at risk in the present study before the time of the interview.

The analyses were adjusted for baseline characteristics such as sex, age, Dukes' stage, local recurrence and chronic diseases other than cancer. These biological variables were considered because of their significance for the patient's prognosis.

The different parts of the social network were considered individually as well as mutually adjusted. These mutual adjustments were performed with coarser groupings of the social network categories, with partner categorised according to whether or not the patient had a partner at the time of the interview, children categorised into more contact versus the rest, and grandchildren, friends, and colleagues categorised into less contact versus the rest.

If the association with changes in the contact frequency with the social network merely reflected the short-term prognosis then the difference between different categories would diminish with time since the interview. We investigated this using time-dependent covariates. The associations with changes in contact frequency did not depend on time since interview.

The patients were approached at very different time points relative to the primary operation. Therefore, the implication of a given answer might be substantially different, depending on whether the patient was interviewed 1 year or 6 years after the surgery. We therefore presented the associations with the (overall) significant social variables, dividing the cohort into three groups according to the length of the time interval between primary operation and interview using the cut points 2 years and 4 years.

The regression analyses provided an all-cause mortality rate ratio with 95% confidence intervals (CI). Tests and 95% CI were based on Wald's test of the Cox regression parameters. The software used was the SAS statistical package version 8.0 for Unix.

3. Results

Of the 770 patients included in the study, 431 (56%) died during follow-up and 339 were censored on 21 March 2002 (Table 1). Most patients in 1991 had reported unaltered contact with their social network after the operation. The all-cause mortality was significantly lower for women than for men and increasing with higher age at operation. All clinical factors were significantly related to survival in the expected direction with impaired survival among patients with Dukes' stage 'C' and 'D', local recurrence and/or presence of chronic disease. The association between mortality and marital status was mainly a difference between the two large categories: patients with the same partner as before the operation and patients who had lost the partner before the operation. Having lost the partner before the operation was significantly related to a higher mortality rate compared to patients with the same partner, independently of adjustments (Table 1). The remaining partner categories were not significantly different from either of the two large categories (data not shown). The simultaneous test of all partner categories was not statistically significant ($p = 0.09$) when adjusted for the biological baseline characteristics. However, when the social variables were mutually adjusted, the simultaneous test showed borderline significance ($p = 0.05$, data not shown).

Increased contact with the children was associated with a higher mortality rate compared to unaltered contact with the children, independently of adjustments.

Regarding the contact with grandchildren, the all-cause mortality was significantly higher for patients with either increased or decreased contact. The simultaneous test of changes with grandchildren was significant ($p = 0.01$, Table 1) when adjusted for the biological baseline characteristics, but clearly insignificant when adjusted for the other social variables ($p = 0.24$, data not shown). This was due to adjustment for contact with children.

No associations were seen for other relatives.

The associations between all-cause mortality and contact with friends and with colleagues became insignificant when adjusted for the other social variables in the simultaneous test ($p = 0.17$ and $p = 0.07$ respectively, data not shown).

The significant effect of having lost the partner before the operation weakened as time passed between the initial operation and the interview (Table 2). Further, the effect of an increased contact frequency with the children was strongest among those patients, who were interviewed more than 4 years after the initial operation for cancer.

4. Discussion

The partner is considered to be one of the most important persons in the social network, if not the most important. In the present study we found that losing the partner before the operation by divorce or the partner's death was associated with impaired survival compared to the survival among patients living with the same partner as before the operation. In a Norwegian study among 14,231 women with a cancer diagnosis (all cancers) in the period 1966–1990, divorced women were found to have significantly impaired survival whereas the survival of widowed women was the same as for married women.[15] In the same study they examined women diagnosed specifically with colorectal cancer ($n = 842$) and found that the impaired survival was seen only for widowed women. Another study could not demonstrate any effect of being widowed or divorced on survival but showed that being never-married was associated with a higher mortality of colorectal cancer.[22] A literature review by De Boer et al. concerning psychosocial correlates of cancer relapse and survival showed that being married was positively related to overall survival in two studies, negatively related in three studies and showed no relation in two studies.[23] Whether there is a true effect of marital status on survival is unclear with the inconsistency of the findings in the literature, but our study supports an association between marital status and survival of colorectal cancer patients. We do not know why those who did not have a partner during cancer treatment had impaired survival. A possible explanation could be that supportive caregivers like a partner ensure more active cancer treatment.[24] Unfortunately, we have no information on adjuvant treatment but future studies should investigate whether patients without a partner receive optimal treatment.

Contrary to our expectations, we found that patients who reported an increased contact with their children had impaired survival. To the best of our knowledge, this has not been observed in other studies. It could be hypothesised that an increased contact with children in the family might be expected when a person is acutely ill; however, this cannot explain the continued impaired survival during the period of follow-up. We cannot exclude the existence of a feedback mechanism where bad health leads to an increased contact between the patients and their children. This was suggested by the observation that the association was strongest for those patients who were interviewed the longest time after the initial operation for cancer where the increased contact frequency with the children can no longer be explained by the acute situation. Those who maintained a higher contact frequency several years postoperatively may be patients suffering from low physical functioning due to conditions not accounted for in the interview and the following statistical adjustment.

Our study population could be regarded as a survivor cohort, since all patients survived at least 1–6 years after their

Table 1 – Estimated all-cause mortality rate ratios (RR) for the baseline characteristics and for the changes in contact with the social network from before the operation to the time of the interview analysed in the study of changes in the social network and survival in colorectal cancer patients, Copenhagen, Denmark 1991–2002[a]

		Total (n = 770)	Deaths (n = 431)	RR[b]	95% CI[c] and p value
Sex	Female	366	185	0.8	[0.6;0.9]
	Male	404	246	1.0	reference
Age at operation[d]	< 50 years	60	13	1.5	[1.3;1.7]
	50–60 years	161	72		
	60–70 years	333	189		
	70–80 years	216	157		
Dukes' stage	A	160	76	0.9	[0.7;1.2]
	B	382	202	1.0	reference
	C	165	110	1.7	[1.3;2.1]
	'D'[e]	43	33	2.0	[1.4;2.9]
	Unknown	20	10		
Local recurrence	Verified or possible recurrence	58	48	2.5	[1.8;3.4]
	No recurrence	710	381	1.0	reference
	Unknown	2	2		
Other chronic disease	Yes	297	186	1.2	[1.0;1.5]
	No	472	244	1.0	reference
	Unknown	1	1		
Partner					p = 0.09
	Same partner as before the operation	539	285	1.0	reference
	Changed partner since the operation	9	6	1.7	[0.7;3.8]
	Found a partner after the operation	14	9	0.8	[0.4;1.7]
	Had lost their partner after the operation	37	17	0.8	[0.5;1.4]
	Had lost their partner before the operation	145	95	1.4	[1.1;1.8]
	Never had a partner	26	19	1.3	[0.8;2.1]
Children					p = 0.004[f]
	Decreased contact after the operation	32	17	1.1	[0.7;1.8]
	Unaltered contact after the operation	576	310	1.0	reference
	Increased contact after the operation	69	48	1.7	[1.3;2.3]
	No children	92	56	1.0	[0.8;1.4]
	Unknown	1	0		
Grandchildren					p = 0.01[f]
	Decreased contact after the operation	31	23	1.6	[1.0;2.4]
	Unaltered contact after the operation	468	269	1.0	reference
	Increased contact after the operation	40	28	1.6	[1.1;2.4]
	Had no grandchildren before the operation	26	11	1.0	[0.8;1.3]
	No grandchildren	203	98		
	Unknown	2	2		
Other relatives					p = 0.46[f]
	Decreased contact after the operation	29	19	1.1	[0.7;1.9]
	Unaltered contact after the operation	617	336	1.0	reference
	Increased contact after the operation	43	24	1.3	[0.8;2.0]
	No other relatives	81	52	1.1	[0.8;1.5]
Friends					p = 0.03[f]
	Decreased contact after the operation	47	32	1.6	[1.1;2.3]
	Unaltered contact after the operation	628	334	1.0	reference
	Increased contact after the operation	45	27	1.3	[0.9;1.9]
	No friends	46	35	1.3	[0.9;1.9]
	Unknown	4	3		
Colleagues[g]					p = 0.01[f]
	Decreased contact after the operation	25	19	2.0	[1.2;3.2]
	Unaltered contact after the operation	345	176	1.0	reference
	Increased contact after the operation	20	7	0.7	[0.3;1.7]
	No colleagues	380	229	1.2	[1.0;1.5]

a The biological baseline variables sex, age at operation, Dukes' stage, local recurrence and chronic diseases other than cancer were mutually adjusted. The social network variables were adjusted for these biological baseline variables but not mutually adjusted.

b RR = rate ratio, estimates indicate all-cause mortality compared to the reference category.

Table 1 – *continued*

c 95% CI = 95% confidence interval.
d Age is considered a linear variable in the regression analysis; the estimate refers to a 10-year difference in age.
e Stage 'D' denotes the presence of distant metastases at the time of diagnosis.
f *p* value = test of association with changes in the contact frequency among patients with the relevant relation in the network.
g Colleagues whom the patients see in their leisure time.

primary operation and were followed-up on survival until March 2002. An advantage of this study population was that the patients had already survived the critical period after the operation where the effect, if any, of changes in the social network on survival may be difficult to detect because of the much greater importance of the biological prognostic factors in this critical period. However, the large variation in the length of the time interval between operation and interview means that the implications of a given answer might vary substantially. We found that the adverse prognosis observed among the patients who reported increased contact with their children was mainly seen among the patients interviewed more than 4 years after the initial operation.

The retrospective design of the original study may have influenced the patients' answers about changes in their social network. The patients in our study were asked only once about changes in their social network after the operation. In other studies,[17,18,25] the study population has been asked several times over a suitable period of time, which possibly provided a more realistic picture of the changes. However, if a causal relation exists between changes in the social network and mortality, it is unclear what is most important – the perceived or the actual changes in the social network.

A limitation in our study is that measurements of the social network provide only an indirect index of the availability of social support and do not provide information about whether a person's specific need for social support during periods of stress is adequately met.[26] However, in the original study, patients were asked in general whether they had received the support they needed after the operation and 706 patients (92%) reported that they had received the needed support.

In conclusion, our study provided findings, which indicated an association between marital status and survival after colorectal cancer. Impaired survival among patients who had lost their partner before cancer treatment possibly reflected less active cancer treatment among these patients. This needs investigation in future studies. Our findings with children illustrates that every study of the importance of changes in the contact with the social network is problematic due to the fact that it is difficult to distinguish between cause and effect between health and changes in the contact with the social network without contacting each person in the social network and ask them why they have changed the contact frequency. Using an endpoint such as survival may provide small effects of the social network, and it is possible that there are more beneficial effects of the social network on endpoints such as quality of life, anxiety and distress. However, further research is needed to elucidate the effect of interactions within the social network for patients with cancer.

Table 2 – Mutually adjusted all-cause mortality rate ratios (RR) for changes in partner and in contact with the children from before the operation to the time of interview analysed in the study on influence of changes in the social network on survival among 770 patients with colorectal cancer, Copenhagen, Denmark 1991–2002

	All patients		Time between operation and interview					
			Less than 2 years (deaths *n* = 118)		2–4 years (deaths *n* = 163)		More than 4 years (deaths *n* = 137)	
	RR[a]	95% CI[b] and *p* value	RR[a]	95% CI[b] and *p* value	RR[a]	95% CI[b] and *p* value	RR[a]	95% CI[b] and *p* value
Partner		*p* = 0.04		*p* = 0.08		*p* = 0.46		*p* = 0.15
Same partner as before the operation	1.0	reference	1.0	reference	1.0	reference	1.0	reference
Changed partner since the operation	1.7	[0.8;4.0]	8.0	[1.8;35.4]	0.8	[0.3;2.7]	6.0	[0.8;45.4]
Found a partner after the operation	0.9	[0.4;1.7]	1.9	[0.6;6.1]	3.3	[0.8;14.8]	0.5	[0.2;1.5]
Had lost the partner after the operation	0.8	[0.5;1.3]	0.7	[0.2;2.7]	0.9	[0.4;2.0]	0.9	[0.4;2.0]
Had lost the partner before the operation	1.4	[1.1;1.8]	1.4	[0.8;2.4]	1.4	[0.9;2.0]	1.1	[0.7;1.8]
Never had a partner	1.5	[0.8;2.6]	1.4	[0.5;4.1]	1.1	[0.4;2.7]	2.6	[0.9;7.4]
Children		*p* = 0.002[c]		*p* = 0.46[c]		*p* = 0.13[c]		*p* < 0.0001[c]
Decreased contact after the operation	1.1	[0.7;1.9]	0.5	[0.1;4.0]	2.2	[1.0;4.7]	1.0	[0.5;2.2]
Unaltered contact after the operation	1.0	reference	1.0	reference	1.0	reference	1.0	reference
Increased contact after the operation	1.7	[1.3;2.4]	1.5	[0.7;2.9]	1.1	[0.6;1.9]	3.0	[1.9;4.8]
No children	1.0	[0.7;1.4]	0.8	[0.4;1.6]	0.8	[0.5;1.6]	1.2	[0.6;2.4]

a RR = rate ratio; estimates indicate all-cause mortality compared to the reference category, mutually adjusted and adjusted for sex, age, Dukes' stage, local recurrence and chronic diseases other than cancer.
b 95%CI = 95% confidence interval.
c *p*value = test of any association with changes in the contact frequency among patients with children.

Conflict of interest statement

None declared.

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