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Quality of Life Among Long-term Non-Hodgkin Lymphoma Survivors

A Population-based Study

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BACKGROUND. The objective of this population-based study was to document the long-term effects (5–15 years postdiagnosis) of non-Hodgkin lymphoma and its treatment on health-related quality of life (HRQL) and social problems.

METHODS. The population-based Eindhoven Cancer Registry was used to select all patients who were diagnosed with non-Hodgkin lymphoma from 1989 to 1998. Three hundred sixty patients were invited to complete the 36-item Short Form Health Survey (SF-36) and the Quality of Life-Cancer Survivors questionnaire, and 294 patients (82%) responded.

RESULTS. Patients who had received chemotherapy reported significantly worse psychological and social well-being and health-related quality of life (HRQL) than patients who had not received chemotherapy. Radiotherapy and watchful waiting were not associated significantly with HRQL outcomes. Patients who were diagnosed from 10 to 15 years earlier reported better social well-being than patients who were diagnosed from 5 to 9 years earlier. Compared with an age-matched, normative sample from the general population, patients reported significantly worse general health and less vitality, but they reported less bodily pain. Practical problems were reported with work (41%), obtaining health care insurance (6%) and life insurance (15%), and obtaining a home mortgage (22%).

CONCLUSIONS. From 5 to 15 years after diagnosis, the general health perceptions and vitality levels of non-Hodgkin lymphoma survivors remained significantly lower than those of their peers in the of general population. In addition, survivors faced practical problems with work and finances that deserve additional attention during the period of rehabilitation. *Cancer* 2007;109:1659–67. © 2007 American Cancer Society.

KEYWORDS: non-Hodgkin lymphoma, long-term survivors, quality of life, Quality of Life-Cancer Survivors questionnaire; 36-item Short Form Health Survey.

In the Netherlands, the annual incidence of non-Hodgkin lymphoma is 1 in 8000. There are approximately 2000 new cases annually.¹ The disease occurs predominantly in individuals aged >45 years. The number of survivors from non-Hodgkin lymphoma continues to increase. Whereas there were approximately 11,000 non-Hodgkin lymphoma survivors in the Netherlands in the year 2000, this number is expected to increase to 19,000 in the year 2010.¹ The increasing incidence of cancer in general, the aging of the population, the use of appropriate staging techniques, and effective treatments all contribute to this rapid increase.² For individuals aged <60 years at diagnosis, the 5-year and 10-year relative survival rates are 75% and 63%, respectively. For those aged ≥60 years, these rates are 50% and 34%, respectively.³

Cancer and its treatment can have a significant effect on the health-related quality of life (HRQL) of patients during diagnosis and treatment and years after the treatment has been completed.⁴ Both so-called *generic* and *condition-specific* HRQL can be affected. Whereas fairly large numbers of studies have been conducted on the HRQL of patients with Hodgkin lymphoma, investigations of the HRQL of patients with non-Hodgkin lymphoma have been scarce,⁵⁻⁸ although the latter disease is much more common. In some studies, mixed samples of patients with lymphoma or patients with leukemia and lymphoma are pooled together.⁹⁻¹¹

We believe that it is important to describe HRQL in patients with non-Hodgkin lymphoma and to report this separately from HRQL in patients with Hodgkin lymphoma because of the differences in age at diagnosis and treatment. To the best of our knowledge, to date, only 1 study has investigated the HRQL of long-term survivors of non-Hodgkin lymphoma.⁵ For the current report, we employed the definition of long-term survivorship recommended by the American Cancer Society: surviving the initial diagnosis for ≥ 5 years.¹² In that study of 44 survivors, lower levels of physical HRQL were reported compared with the levels in a healthy control group.

The objective of the current, population-based study was to document the long-term HRQL effects of non-Hodgkin lymphoma and its treatment. Specifically, we investigated the association between a range of sociodemographic factors (eg, age, marital status, employment status, education) and clinical factors (eg, disease stage, grade, therapy, comorbidity, time since diagnosis) and self-reported HRQL. In addition, a comparison was made between the HRQL of non-Hodgkin lymphoma survivors and the HRQL of an age-matched, normative sample drawn from the general population. Finally, for this study, we documented the prevalence of a range of practical problems experienced by this survivor group, including changes in work status and problems with obtaining health care insurance, life insurance, and home mortgages.

MATERIALS AND METHODS

Setting and Participants

A population-based, cross-sectional survey was conducted at the Eindhoven Cancer Registry (ECR). The ECR records data on all patients who are newly diagnosed with cancer in the southern part of the Netherlands, an area with 2.3 million inhabitants, 18 hospital locations, and 2 large radiotherapy institutes.³ The ECR was used to select all patients who

were diagnosed with non-Hodgkin lymphoma between 1989 and 1998. We defined non-Hodgkin with the following International Classification of Diseases for Oncology codes; 9590.3 to 9596.3 (malignant lymphomas, not otherwise specified or diffuse), 9670.3 to 9719.3 (malignant lymphoma diffuse, specified type), 9760.3 to 9764.3 (immunoproliferative diseases), and 9850.3 (lymphosarcoma cell leukemia). Participants aged ≥ 75 years at diagnosis were excluded, because it was expected that they would have difficulty in completing a self-administered questionnaire without assistance. To exclude all patients who had died before November 1, 2004, our database was linked with the database of the Central Bureau for Genealogy, which collects data on all deceased Dutch citizens through the civil municipal registries. Data collection was started in November 2004. Approval for the study was obtained from a local, certified Medical Ethics Committee.

Data Collection

The responsible clinicians sent their (former) patients a letter inviting them to participate in the study and a copy of the survey instrument. In the letter, it was explained that, by returning a completed questionnaire, the patient agreed to participate and consented to linkage of the questionnaire data with information about their disease and treatment history as registered at the ECR. Patients were reassured that nonparticipation did not have any consequence for their follow-up care or treatment. If the questionnaire was not returned within 2 months, then a reminder letter was sent together with an additional copy of the questionnaire. Returned questionnaires did not contain any explicit identifiers (ie, names) but, rather, were coded by number for purposes of data collection tracking and linkage with the ECR database.

Study Measures

The ECR routinely collects data on tumor characteristics, including date of diagnosis, subsite, histology, stage (Tumor-Lymph Node-Metastasis clinical classification¹³), and treatment, and patient background characteristics, including gender, date of birth, and comorbidity at the time of diagnosis (a slightly adapted version of the Charlson comorbidity index¹⁴).

The Dutch-language version of the 36-item Short Form Health Survey (SF-36) was used to assess generic HRQL.¹⁵ Following standard scoring procedures, all 8 scales were converted linearly to a scale from 0 to 100, with higher scores indicating better functioning. The internal consistency reliability of all scales was above the 0.70 criteria recommended for group

comparisons. Two higher order component scores for physical and mental health also were calculated. The SF-36 scores for the patient sample were compared with scores for an age-matched, normative sample drawn from a large, random, nationwide sample of adults ($n = 1742$) drawn from the general Dutch population.¹⁶

HRQL survivorship issues were assessed with the Dutch-language version of the Quality of Life-Cancer Survivors (QOL-CS) questionnaire,^{17,18} which is composed of 45 visual analogue scales, each of which ranges from 0 (worst outcome) to 10 (best outcome). The questionnaire contains 4 multiitem subscales that assess Physical, Psychological, Social, and Spiritual Well-being. It examines issues of particular concern to long-term cancer survivors, such as distress since diagnosis, sexuality, employment, uncertainty about the future, and the role of spirituality and religion.¹⁹ It has been demonstrated that the QOL-CS is a valid and reliable instrument when used among American^{17,20,21} and Dutch¹⁸ cancer survivors, although the subscale Spiritual Well-being showed low reliability and validity in the latter cohort.

The questionnaire also included questions on marital status, educational level, disease progression, and current comorbidity. Furthermore, patients were asked questions about changes in occupation and problems with insurance and financial loans (ie, home mortgage) because of cancer.

Statistical Analysis

Routinely collected data from the ECR on patient and tumor characteristics enabled us to compare the groups of respondents, nonrespondents, and patients with unverifiable addresses by using Student *t* tests for continuous variables and the chi-square statistic for categorical variables. Survivors with recurrent disease or a new primary malignancy were excluded from further analysis.

Multivariate linear regression analyses were carried out to investigate the independent association between sociodemographic (age, comorbidity, marital status, education, and occupation) and clinical variables (time since diagnosis, stage, grade, treatment) and the SF-36 and QOL-CS scale scores by considering *P* values $<.01$ statistically significant. The independent variables were categorized as follows. Age and time since diagnosis were entered as continuous variables; tumor stage was entered as stage I (reference category), II, III, IV, or unknown; And tumor grade was entered as uncommon, indolent (reference category), aggressive, or other. Therapies were entered as therapies (reference category) versus no

therapies, and comorbidity was entered as comorbidity (reference category) versus no comorbidity. Marital status was entered as married (reference category), not married, divorced. Education was entered as high (reference category) versus low. Occupation was entered as work (reference category), no work, or retired.

Analyses of variance were used to compare the mean scores of the non-Hodgkin lymphoma sample on the individual SF-36 scales and higher order component scales with those of the normative sample from the Dutch general population.

Percentages of patients that experienced changes in their work situations and problems with insurance and home mortgages were calculated. Work-related outcomes were assessed only for those individuals aged <60 years at diagnosis, because that is the age at which a substantial percentage of Dutch workers retire. All statistical analyses were performed using SAS (version 9.1 for Windows; SAS Institute Inc., Cary, NC).

RESULTS

Questionnaires were sent to 360 non-Hodgkin lymphoma survivors, and 294 completed questionnaires were returned (82% response rate) (Fig. 1). A comparison between respondents, nonrespondents, and patients with unverifiable addresses showed that the latter generally were younger. Nonrespondents more often were diagnosed with stage I disease, whereas respondents more often were diagnosed with aggressive non-Hodgkin lymphoma (Table 1). Seventy-three respondents were excluded from the final analysis because they had progressive disease or their therapy was unknown. The final analysis was based on 221 patients.

The mean age at diagnosis was 45.4 years, and patients were approximately 10 years older at the time of the survey (Table 2). Most respondents were married (67%), had a medium (30%) or high (22%) educational level, and were not employed (70%) at the time of the survey. A large percentage of patients had been diagnosed with stage I disease (41%), and the treatment most often received was chemotherapy only (37%) or chemotherapy in combination with radiotherapy (26%). Half of the patients reported ≥ 1 comorbid condition(s), and the most common comorbidities were arthritis (22%), hypertension (19%), and asthma (10%).

The results of the multivariate linear regression analyses, with the SF-36 scales as outcome variables, are reported as β coefficients in Table 3. Older patients scored significantly lower on the SF-36 Physical Func-

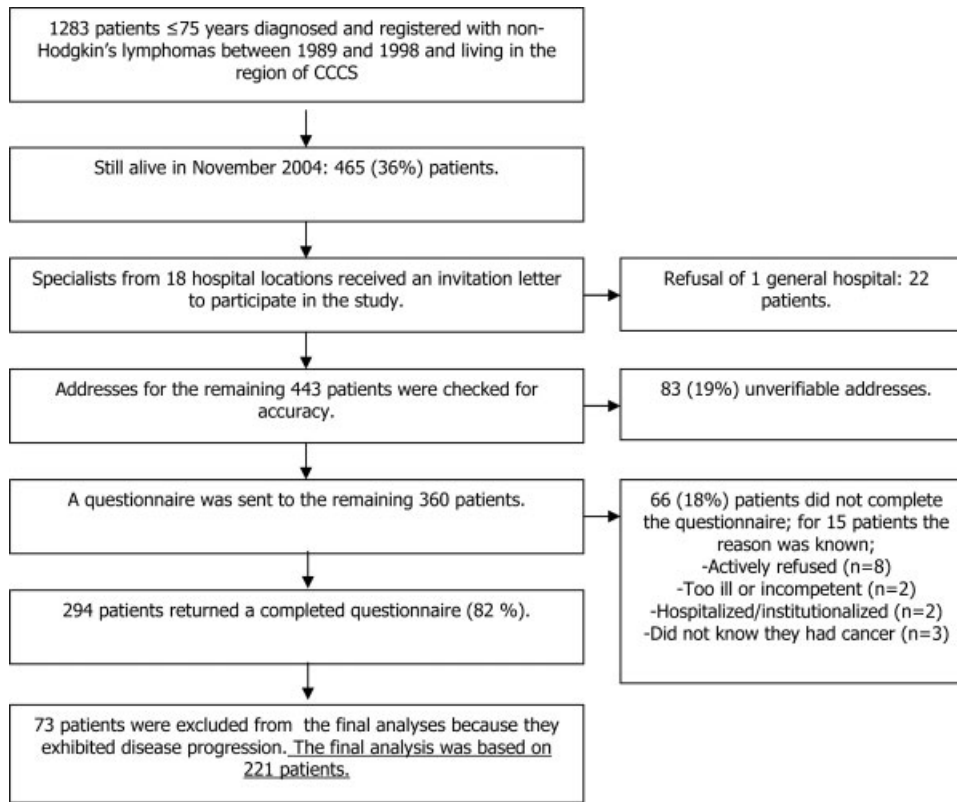


FIGURE 1. Flow chart of the data collection process. CCCS indicates the Comprehensive Cancer Center South (Eindhoven Cancer Registry, the Netherlands).

tioning items than younger patients. Patients with comorbid health conditions reported significantly poorer Physical Functioning and more pain than those without such conditions. Patients who had jobs reported being more vital and had better Mental Well-being scores than patients who were not working.

The results of the multivariate linear regression analyses, with the QOL-CS scales as outcome variables, are reported as β coefficients in Table 4. Time since diagnosis was associated positively with Social Well-being as measured on the QOL-CS. Having received chemotherapy was associated with lower scores on Psychological Well-being, Social Well-being, and the QOL-CS total score.

The HRQL of survivors, as measured by the SF-36, was compared with that of an age-matched, normative sample from the general Dutch population (Fig. 2). The survivor group exhibited significantly lower scores than the normative sample for General Health Perception ($P < .001$) and Vitality ($P < .001$) but higher scores for Bodily Pain (indicating less pain; $P < .001$). No statistically significant differences were observed for any of the other SF-36 scales.

Table 5 reports the results pertaining to employment and problems in obtaining health care insur-

ance, life insurance, and a home mortgage. The majority of survivors (59%) stated that their work situation had not changed as a result of their cancer. Nevertheless, 41% of survivors indicated that they had changed jobs, reduced the number of hours worked, or stopped working entirely (including work disability) as a result of their cancer. Only 6% of survivors reported having experienced cancer-related problems in obtaining health insurance. Fifteen percent reported problems obtaining life insurance, and 22% reported problems with obtaining a mortgage. When the latter figures were limited to the individuals who actually attempted to obtain insurance or a mortgage during the period after their cancer diagnosis, the percentage of survivors with problems was substantially higher (12%, 60%, and 73% for health insurance, life insurance, and mortgage, respectively).

DISCUSSION

The results of this study indicate that patients who received chemotherapy experienced worse psychological and social well-being and HRQL than patients who did not receive chemotherapy. Patients who were diagnosed 10 to 15 years earlier reported better

TABLE 1
Sociodemographic and Clinical Characteristics of Questionnaire Respondents, Nonrespondents, and Patients With Unverifiable Addresses

Characteristic	No. of patients (%)			P
	Respondents, N = 294	Nonrespondents, N = 66	Patients with unverifiable addresses, N = 83	
Sex				
Men	149 (51)	35 (53)	54 (65)	
Women	145 (49)	31 (47)	29 (35)	.07
Age at time of survey, y				
<55	92 (31)	21 (32)	41 (49)	
55-69	109 (37)	24 (36)	20 (24)	
≥70	93 (32)	21 (32)	22 (27)	.04
Years since diagnosis				
5-9	198 (67)	47 (71)	51 (61)	
10-15	96 (33)	19 (29)	32 (39)	.43
Stage at diagnosis				
I	114 (39)	31 (47)	26 (31)	
II	62 (21)	9 (14)	18 (22)	
III	27 (9)	4 (6)	10 (12)	
IV	76 (26)	10 (15)	17 (20)	
Unknown	15 (5)	12 (18)	12 (14)	<.01
Grade				
Uncommon	4 (1)	2 (3)	2 (2)	
Indolent	86 (29)	19 (29)	26 (31)	
Aggressive	170 (58)	27 (41)	39 (47)	
Unknown	34 (12)	18 (27)	16 (19)	.03
Primary treatment				
CH	112 (38)	16 (24)	23 (28)	
RT	38 (13)	11 (17)	13 (16)	
RT + CH	69 (24)	17 (26)	22 (27)	
S ± RT ± CH	38 (13)	9 (14)	7 (8)	
Watchful waiting	33 (11)	12 (18)	15 (18)	
Unknown	4 (1)	1 (2)	3 (4)	.30

CH indicates chemotherapy; RT, radiotherapy; S, surgery; ± with or without.

psychological and social well-being than patients who were diagnosed 5 to 9 years earlier. Compared with healthy adults from the general population, patients reported worse general health and less vitality but also less bodily pain. Practical problems, including changes in work situation and problems obtaining new health insurance, life insurance, and mortgages, were relatively common.

To our knowledge, there is only 1 study among 141 non-Hodgkin lymphoma patients that also investigated HRQL in relation to treatment. In that study, patients who received chemotherapy reported lower overall HRQL scores compared with patients who did not receive chemotherapy.^{7,18} The current study confirmed those results.

Improvement in HRQL over a long period has not been documented previously in patients with non-Hodgkin lymphoma, although it is known that

TABLE 2
Sociodemographic and Clinical Characteristics of Non-Hodgkin Lymphoma Survivors Without Recurrent Disease, Metastasis, or New Primary Malignancies

Characteristic	No. of patients (%), N = 221
Sex	
Men	112 (51)
Women	109 (49)
Age at diagnosis, y	
Mean	45.4
<55	122 (55)
55-69	80 (36)
≥70	19 (9)
Age at time of survey, y	
Mean	55.3
<55	79 (36)
55-69	73 (33)
≥70	69 (31)
Time since diagnosis, y	
5-9	145 (66)
10-15	76 (34)
Stage at diagnosis	
I	90 (41)
II	49 (22)
III	19 (8.6)
IV	51 (23)
Unknown	12 (5)
Primary treatment	
CH	82 (37)
RT	33 (15)
RT + CH	58 (26)
S ± RT ± CH	28 (13)
Watchful waiting	20 (9)
Comorbidity	
No	101 (46)
Yes	120 (55)
Most frequent comorbid conditions	
1. Arthrosis	48 (22)
2. Hypertension	43 (19)
3. Asthma	21 (10)
Marital status	
Married	147 (67)
Not married/divorced	39 (18)
Widowed	24 (11)
Unknown	11 (5)
Education level	
Low	93 (42)
Medium	66 (30)
High	48 (22)
Unknown	14 (6)
Current occupation	
Employed	66 (30)
Unemployed	59 (27)
Retired	84 (38)
Unknown	12 (5)

CH indicates chemotherapy; RT, radiotherapy; S, surgery; ± with or without.

they experience a significant improvement in HRQL soon after the completion of therapy compared with their baseline levels.⁶ The observed differences in

TABLE 3
Multivariate Linear Regression Model Evaluating Independent Variables for the 36-Item Short Form Health Survey Subscale Scores

Independent variable	SF-36 subscales*									
	PF	RP	BP	GH	VT	SF	RE	MH	PCS	MCS
Age (at time of questionnaire)	-0.37 [†]	NS	NS	NS	NS	-0.26 [‡]	NS	NS	-0.24 [‡]	NS
Time since diagnosis	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Tumor stage	NS	NS	NS	-0.19 [‡]	NS	NS	NS	0.23 [‡]	NS	0.21 [‡]
Tumor grade	NS	NS	NS	NS	NS	NS	NS	NS	NS	-0.29 [‡]
Radiotherapy	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Chemotherapy	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Watchful waiting	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Comorbidity	-0.18 [‡]	-0.19 [‡]	-0.22 [§]	NS	NS	NS	NS	NS	-0.24 [§]	NS
Marital status	NS	NS	-0.17 [‡]	NS	NS	-0.20 [‡]	NS	NS	-0.18 [‡]	NS
Education	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Occupation	NS	NS	NS	NS	0.33 [§]	NS	NS	0.30 [§]	NS	NS

SF-36 indicates the 36-item Short Form Health Survey; PF, Physical Functioning; RP, Role Limitations/Physical Health; BP, Bodily Pain; GH, General Health; VT, Vitality; SF, Social Functioning; RE, Role Limitations/Emotional Problems; MH, Mental Health; PCS, Physical Component Scale; MCS, Mental Component Scale; NS, nonsignificant.

* Standardized β coefficients.

[†] $P < .001$

[‡] $P < .05$.

[§] $P < .01$.

TABLE 4
Multivariate Linear Regression Model Evaluating Independent Variables for the Quality of Life-Cancer Survivors Subscale Scores

Independent variable	QOL-CS subscale*				Total score
	Physical	Psychological	Social	Spiritual	
Age (at time of questionnaire)	NS	NS	NS	NS	NS
Time since diagnosis	NS	0.17 [†]	0.21 [‡]	NS	NS
Tumor stage	NS	0.19 [†]	NS	NS	0.16 [†]
Tumor grade	NS	NS	NS	NS	NS
Radiotherapy	NS	NS	NS	NS	NS
Chemotherapy	NS	-0.22 [‡]	-0.30 [‡]	NS	-0.25 [‡]
Watchful waiting	NS	NS	NS	NS	NS
Comorbidity	-0.18 [†]	NS	NS	NS	NS
Marital status	NS	NS	NS	NS	NS
Education	NS	NS	NS	NS	NS
Occupation	NS	NS	NS	NS	NS

QOL-CS indicates the Quality of Life-Cancer Survivors questionnaire; NS, nonsignificant.

* Standardized β coefficients.

[†] $P < .05$.

[‡] $P < .01$.

HRQL were significant only when they were measured with the QOL-CS, and not with the SF-36. This may reflect, in large part, the fact that the QOL-CS was developed specifically for use among cancer survivors, whereas the SF-36 is a generic HRQL instrument. The QOL-CS also was used in a combined group of leukemia and lymphoma survivors (N = 53 patients) who remained alive ≥ 10 years after their

diagnosis. Comparing their scores with those from the subsample of survivors in our study who were > 10 years postdiagnosis yielded fairly similar results for physical quality of life (mean score, 7.6 vs 7.9), psychological quality of life (mean score, 6.6 vs 7.1), social quality of life (mean score, 7.6 vs 7.4), spiritual quality of life (mean score, 6.5 vs 4.6), and overall HRQL (mean score 7 vs 6.9).⁹ The substantially lower scores observed in our study on the subscale spiritual well-being probably were related to cultural differences between American and Dutch survivors, as described previously.^{18,22}

Differences in General Health Perceptions between survivors and an age-matched, normative sample from the general population were in line with a previous study that included survivors of Hodgkin lymphoma and non-Hodgkin lymphoma from 2 to 16 years after diagnosis⁵ and by studies that included only survivors of Hodgkin lymphoma.²³⁻²⁷ Differences in Vitality scores also were confirmed: Vitality was higher in controls (n = 2214 controls) than in survivors of Hodgkin lymphoma (n = 459 patients).²⁵ Results from a Swedish study among patients with lymphoma (N = 95 patients) were somewhat at variance with our results, because those investigators they did not observe an effect for Vitality, General Health Perceptions, or Bodily Pain. In that study, the authors concluded that patients had a similar HRQL compared with a reference population, except for Role Functioning scores.¹¹ However, a comparison of those results with our cur-

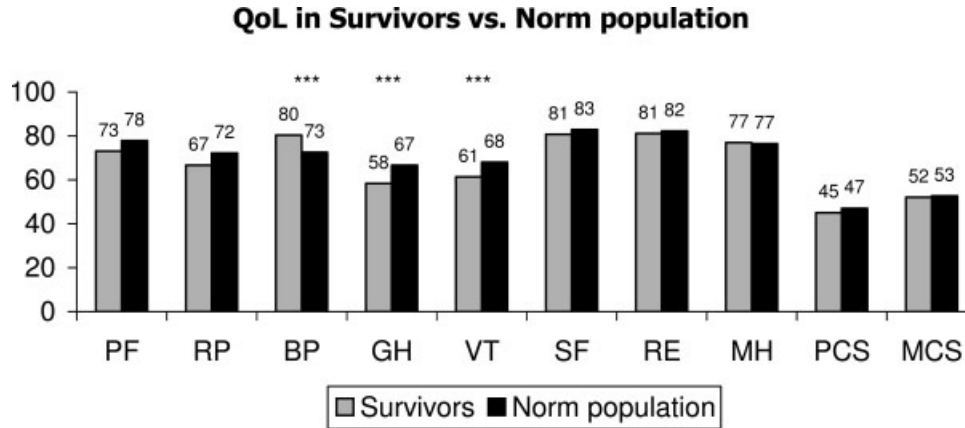


FIGURE 2. Subscale scores on the 36-item Short Form Health Survey questionnaire. Differences between survivors of non-Hodgkin lymphoma and an age-matched, normative population. Note that higher scores are indicative of better functioning. Single asterisk, $P < .05$; double asterisks, $P < .01$; triple asterisks, $P < .001$. QoL indicates quality of life; PF, Physical Functioning; RP, Role Limitations/Physical Health; RE, Role Limitations/Emotional Problems; VT, Vitality; MH, Mental Health; SF, Social Functioning; BP, Bodily Pain; GH, General Health; MCS, Mental Component Scale; PCS, Physical Component Scale.

TABLE 5
Changes in Work Situation and Problems With Insurance and Mortgages

Change	No. of patients (%)
Changes in work situation, N = 150*	
Nothing changed	89 (59)
Occupational resettlement	5 (3)
Stopped working	10 (7)
Working less hours	19 (13)
Incapable of working	22 (15)
Fired	3 (2)
Problems with, N = 221	
Health care insurance	
Yes	12 (6)
No	85 (39)
Did not try	111 (51)
Life insurance	
Yes	33 (15)
No	22 (10)
Did not try	147 (68)
Mortgage	
Yes	47 (22)
No	17 (8)
Did not try	131 (61)

* The number of patients age ≤ 60 years at the time of diagnosis.

rent results was hampered by the fact that the previous data were based on a short follow-up period (on average, 8 months after diagnosis) and included both Hodgkin lymphoma and non-Hodgkin lymphoma patients.

The lower pain levels reported by the non-Hodgkin lymphoma survivors compared with the healthy

controls have not been reported previously in the literature. We suspect that this is either a chance finding or, if it is real, may reflect a *response shift* phenomenon whereby individuals redefine their internal standards for rating their level of functioning or symptoms (in this case, pain) as a result of their illness experience.^{28,29} Patients may accept pain as an inevitable consequence of having been treated for cancer, a condition they perceive as life threatening. Common benign aches and pains, such as headache, may be considered less burdensome by survivors of non-Hodgkin lymphoma than by their counterparts in the general population.

Changes in the work situation of non-Hodgkin lymphoma survivors have not been reported previously in the literature but were comparable to those reported for Hodgkin disease survivors.^{26,29,30} The percentage of survivors experiencing problems with obtaining health care and life insurance also was in line with the existing literature on Hodgkin lymphoma survivors.^{24,26,30,31} Twenty-two percent of survivors in our study experienced problems obtaining a mortgage because of their disease. These problems were reported by 14% of Hodgkin lymphoma survivors²⁴ in 1 study and by 28% to 33% of survivors in another study.²⁶ The degree to which problems with obtaining insurance and mortgages occur in the general Dutch population is not known; therefore, these results need to be interpreted with some caution. In any event, the current results suggest that patients should be informed about the possible financial consequences of being a cancer survivor and perhaps should be counseled in how best to deal with such issues.

The current study had some limitations that should be noted. First, although we had information about the initial cancer and treatment characteristics of the nonrespondents and patients whose addresses could not be verified, we do not know whether nonrespondents declined to participate in the study because of poor health. Second, the cross-sectional nature of the study did not allow us to determine causal associations or to document changes in HRQL over time. However, we attempted to gain insight into the role of such factors as disease stage, age at diagnosis, grade, years since diagnosis, education, marital status, and comorbidity at diagnosis by including them in the multivariate analyses that examined factors that were associated significantly with a range of HRQL outcomes. The strengths of our study, compared with many earlier survivorship studies, include the population-based versus clinic-based sampling frame and the high response rate, which facilitates generalizing the results to the larger population of long-term, disease-free survivors of non-Hodgkin lymphoma.

In conclusion, 5 to 15 years after diagnosis, the general health perceptions and vitality levels of non-Hodgkin lymphoma survivors remain significantly lower than those for their peers in the general population. In addition, survivors face practical problems with work and finances that deserve additional attention during the period of rehabilitation.

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