EUROPEAN JOURNAL OF CANCER 47 (2011) 221–229

available at www.sciencedirect.com

ScienceDirect

journal homepage: www.ejconline.com

Follow-up care amongst long-term childhood cancer survivors: A report from the Swiss Childhood Cancer Survivor Study

Cornelia E. Rebholz [a], *Nicolas X. von der Weid* [b], *Gisela Michel* [a], *Felix K. Niggli* [c], *Claudia E. Kuehni* [a,*], *for the Swiss Pediatric Oncology Group (SPOG)* [d]

[a] *University of Bern, Institute of Social and Preventive Medicine (ISPM), Swiss Childhood Cancer Registry, Finkenhubelweg 11, CH-3012 Bern, Switzerland*

[b] *Centre Hospitalier Universitaire Vaudois, Pediatric Hematology-Oncology Unit, Rue du Bugnon 21, CH-1011 Lausanne, Switzerland*

[c] *University Children's Hospital Zurich, Department of Oncology, Steinwiesstrasse 75, CH-8032 Zurich, Switzerland*

ARTICLE INFO

Article history:
Received 21 April 2010
Received in revised form 7 July 2010
Accepted 7 September 2010
Available online 11 October 2010

Keywords:
Childhood cancer
Survivors
Follow-up care
Cohort study
Questionnaire

ABSTRACT

In the Swiss Childhood Cancer Survivor Study, we aimed to assess the proportion of long-term survivors attending follow-up care, to characterise attendees and to describe the health professionals involved. We sent a questionnaire to 1252 patients, of whom 985 (79%) responded, aged in average 27 years (range 20–49). Overall, 183 (19%) reported regular, 405 (41%) irregular and 394 (40%) no follow-up. For 344, severity of late effects had been classified in a previous medical examination. Only 17% and 32% of survivors with moderate and severe late effects respectively had made regular visits a decade later. Female gender, after a shorter time since diagnosis, had radiotherapy, and having suffered a relapse predicted follow-up. In the past year, 8% had seen a general practitioner only, 10% a paediatric or adult oncologist and 16% other health specialists for a cancer related problem. These findings underline the necessity to implement tailored national follow-up programmes.

1. Introduction

Organisation of long-term follow-up for childhood cancer survivors has become an important issue. Due to dramatic therapeutic improvements during past decades, survival rates in childhood cancer reached more than 80%[1] resulting in a growing population of long-term survivors.[2] However, two-thirds of survivors have at least one chronic condition, with one-third being classified as severe or life threatening.[3–5] Long-term follow-up aims to reduce late complications of childhood cancer by early diagnosis and management.[2,6] In addition, it allows provision of psychosocial support and lifestyle counselling.[7] Routinely updated evidence-based guidelines are available recommending individual screening of potential late consequences according to treatment received,[8–10] with life-long follow-up recommended for patients who received radiotherapy.[8] Importantly, survivors who have developed late effects should remain in regular care.[7]

* *Corresponding author*: Tel.: +41 (0)31 631 35 07; fax: +41 (0)31 631 35 20.
E-mail address: kuehni@ispm.unibe.ch (C.E. Kuehni).

[d] The Swiss Paediatric Oncology Group (SPOG): Dr. med. R. Angst, Aarau; Prof. Dr. med. M Paulussen, V. Stahel, Basel; Prof. Dr. med A. Hirt, K. Zimmermann, Bern; PD Dr. med A. H. Ozsahin, M. Berner, Geneva; PD Dr. med M. Beck Popovic, Dr. med. E. Garcia, Lausanne; Dr. med L. Nobile Buetti, Locarno; Dr. Med. Pierluigi Brazzola, Bellinzona; Dr. med U. Caflisch, Y. Bonetti, Lucerne; Dr. med J. Greiner, Dr. med. H. Hengartner, F. Hochreutner, St. Gallen; Prof. Dr. med. M. Grotzer, H. Markiewicz Zürich.

0959-8049/$ - see front matter
doi:10.1016/j.ejca.2010.09.017

Little is known, if and how these recommendations are put into practice. Studies in the United States (US), United Kingdom (UK) and Canada reported that contrary to recommendations, only one-third of survivors received regular long-term follow-up.[11–13] In Switzerland and elsewhere, the implementation of follow-up programmes for long-term survivors remains a challenge. The Swiss Paediatric Oncology Group (SPOG) has published recommendations for a standardised assessment of late effects in 1996 suggesting the involvement of medical oncologists and general practitioners for assuring a seamless transition from paediatric to adult care.[5,6] However, it is unknown how these recommendations have been implemented into practice, what proportion of survivors really attend long-term follow-up and where they go. The Swiss health care system has a compulsory national health insurance, with premiums for disadvantaged citizens subsidised by the government. This should guarantee equal access to all treatments.

In this study, we aimed (1) to assess the proportion of long-term childhood cancer survivors attending follow-up, considering severity of late effects, (2) to characterise follow-up attendees and (3) to identify the health professionals involved.

2. Patients and methods

2.1. Study population

The Swiss Childhood Cancer Registry (SCCR) is a population-based registry including all children and young people diagnosed with leukaemia, lymphoma, central nervous system (CNS) tumours, malignant solid tumours or Langerhans cell histiocytosis (LCH) before the age of 16 years.[14,15]

Nested in the SCCR, the Swiss Childhood Cancer Survivor Study (SCCSS) is a nationwide long-term follow-up study that started in 2007 and includes all registered patients who were diagnosed since 1976 and survived at least 5 years. For the current analysis we included all survivors aged 20 years or over at the time of survey, more than 10 years after diagnosis ($n = 1280$).

A subgroup of eligible survivors ($n = 478$) had participated in a standardised medical examination during the 1990s to detect late effects.[5,16] The examination included medical history, clinical examination, neuropsychological testing and laboratory investigations. Severity of late effects was graded from 0 to 4 (see Appendix II: Table 1 for definitions and examples): with grade 0 'no late effects'; grade 1 'asymptomatic, not requiring therapy for late effects' (=mild, e.g. scar); grade 2 'late effects needing continuous medical follow-up' (=moderate, e.g. hypothyroidism); grade 3 'physical or mental sequelae, not likely to be improved by therapy' (=severe, e.g. cognitive deficits limiting schooling); and grade 4 'severely handicapping late effects, leaving patients unable to work independently' (=very severe).[5]

Ethical approval for this study was obtained from the general cancer registry permission of the SCCR (The Swiss Federal Commission of Experts for Professional Secrecy in Medical Research) and a non-obstat statement was obtained from the ethics committee of the canton of Bern.

2.2. Procedure

All survivors received a study information letter from their former treating centre, with the option to decline, report address changes or request the questionnaire in another language (German, French and Italian). Survivors wishing to take part in the study were sent a copy of the questionnaire with a pre-paid return envelope. Reminder letters were sent to non-responders 2 months later. If they did not return the questionnaire at this stage, they were contacted by telephone to answer a shortened version.

2.3. Measures

Baseline demographical information together with prospectively collected medical information on diagnosis and treatment was extracted from the SCCR. Diagnosis was classified according to the International Classification of Childhood Cancer.[17] For the analysis, diagnostic groups with less than 5% survivors were merged. Treatment options included surgery only, chemotherapy (without radiotherapy, may have had surgery), radiotherapy (may have had surgery or chemotherapy) and participants were coded accordingly.

We used a standardised questionnaire derived from childhood cancer survivor studies in the US and UK.[18,19] Furthermore, we included specific socio-demographical measures for comparison with the Swiss population. The main domains of the questionnaire were: quality of life, somatic health, current medication and health service utilisation, psychological distress, health behaviour and socio-economic information.

To assess the proportion of survivors attending follow-up, we first asked whether they still attended follow-up for their cancer. Possible answers included: yes, at the treatment centre; yes, elsewhere (both coded as regular follow-up); no, but sees a doctor every now and then for a medical check-up (coded as irregular follow-up); and no, has not seen a doctor for a while. We also asked participants to select which health professionals they had seen in the past year from a list and whether these visits were related to cancer or not (Appendix II: Questions used in questionnaire (English translation); questionnaire is available at http://www.childhoodcancerregistry.ch/index.php?id=2849).

General health status and physical pain were measured with item 1 and item 7 of the Short Form 36 (SF36).[20] Survivors were also asked if they experienced any late effects of their cancer or treatment. Socio-economic status was measured by education. We grouped parents' and survivors' own education into four categories: 'compulsory schooling', 'vocational training', 'upper secondary education' (including high school, teachers training colleges, technical colleges and upper vocational education) and 'university education'. Survivors were asked whether they had received recommendations for follow-up; either a medical checklist or a copy of their discharge letter. Furthermore, we asked if they had actively searched for further information on their former disease after discharge using any of the following sources: physician, internet, technical books or reports, friends, survivor associations or others.

2.4. Statistical analysis

We used Stata version 10 (Stata Corporation, Austin, Texas) for all analyses. Differences between responders and non-responders were assessed using χ^2- and Kruskal–Wallis trend tests. Factors associated with attending follow-up in the univariate analysis ($p < 0.05$) were assessed in two different logistic regression models. Firstly, we included factors from the SCCR collected at the time of diagnosis. In a second model, we looked at factors assessed in the survey simultaneously to the information on follow-up attendance, to characterise the attendees. Both models were also repeated using multinomial logistic regression comparing non-attendees with irregular and regular follow-up attendees separately.

3. Results

Of the 1441 eligible survivors a valid address was found for 1252 (87%). Amongst these, 985 (79%) returned the questionnaire (Fig. 1) including 71 survivors who only answered the shortened questionnaire. Responders did not differ from non-responders regarding diagnosis and therapy, but were more often female and German speaking (Table 1). Response-rate varied across treatment centres from 71% to 88%. Survivors' mean age at the time of survey was 27.2 years (range 20–49 years) and the mean time elapsed since diagnosis was 20.6 years (10–44 years).

3.1. Use of long-term follow-up by severity of late effects

Of the 985 survivors, 588 (60%) reported to have follow-up; 183 (19%) attended regular and 405 (41%) irregular follow-up. Within the subsample of survivors for whom severity of late effects was assessed in a previous examination, 59/126 (47%) of those with grade 0, 46/88 (52%) of those with grade 1, 56/92 (61%) of those with grade 2, 13/19 (68%) of those with grade 3 and 4/4 (100%) of those with grade 4 late effects attended follow-up (trend test $p < 0.001$). Visits in regular intervals were reported by 9 (7%), 7 (8%), 16 (17%), 6 (32%) and 3 (75%) of those graded as 0, 1, 2, 3 and 4 respectively.

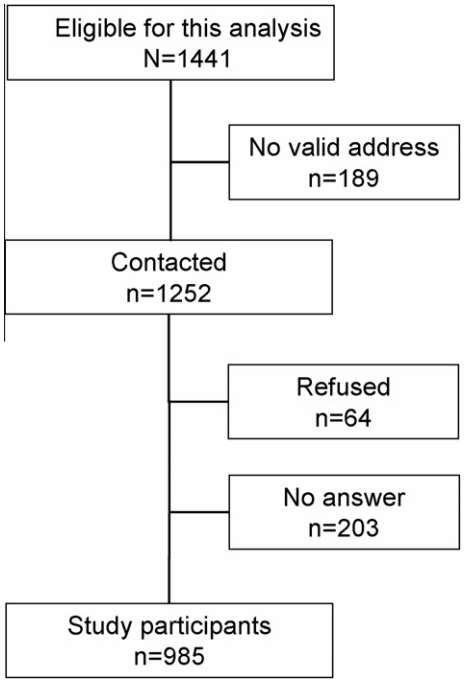

Fig. 1 – Study population and response rate.

3.2. Characteristics of follow-up attendees

Factors associated with use of follow-up were determined in two separate models. First, we assessed which factors *predicted* follow-up attendance, by looking at information assessed *at the time of diagnosis* (Table 2). Females were more likely to attend follow-up than males (odds ratio (OR) = 1.42). Survivors with more than 20 years since diagnosis were less likely to have follow-up than survivors with a shorter time since diagnosis (OR = 0.48). Also treatment modalities predicted use of follow-up: 71% of survivors treated with radiotherapy and 54% of those with chemotherapy but no radiotherapy attended follow-up, compared to 42% of those with surgery only (OR = 2.12 and 3.81). Survivors with a relapse history were more likely to attend (OR = 1.92). Results were similar when comparing regular attendees and irregular attendees separately to non-attendees in a multinomial regression model, with somewhat larger effect sizes for regular attendees (Appendix II: Table 2).

Second, we examined characteristics of attendees *assessed at the time of the survey* (Table 3). In the multivariable model attendees were more likely to report late effects from their cancer treatment (OR = 2.50) and to have actively sought for information about their former disease after discharge (OR = 1.78; information from physician: 30% of attendees versus 15% of non-attendees; internet: 20% versus 14%; technical books/magazines: 21% versus 12%). Socio-economic determinants such as level of education of survivors and having a partner were not associated. Results of the multinomial regression model were again comparable, with larger effect sizes for regular than for irregular attendees, when both were compared to non-attendees (Appendix II: Table 3).

3.3. Health care professionals involved in long-term follow-up

In total, 764 of 914 survivors (84%) reported having visited a health professional in the past year and 312 (34%) said that the visit had been caused by a problem related to their former disease. Of 638 survivors (70% of 914) who had seen a general practitioner in the past year, 164 survivors (22%) had a cancer-related visit (Fig. 2). Eighteen percentage of female survivors (79 of 439) reported a cancer-related visit to the gynaecologist in the past year and 9% ($n = 80$) of survivors had seen a psychologist because of problems related to their cancer. We then grouped cancer-related visits into three different models of follow-up.[21] Of the 914 survivors, 76 (8%) had seen a general practitioner only, 90 (10%) had consulted a paediatric or adult oncologist and 146 (16%) had seen other physicians (some of these had also gone to a general practitioner) (Fig. 3). In the follow-up of survivors of Hodgkin lymphoma, oncologists were most often involved (16 of 80, 20%) whereas survivors of brain tumours mostly attended follow-up at other specialists such as endocrinologists, neurologists, ophthalmologists and psychologists (38 of 100, 38%).

Table 1 – Characteristics of study population by response status.

Characteristics	Non-responders (*n* = 267)			All responders (*n* = 985)				Subgroup of responders with medical examination in 1994–1996 (*n* = 344)		
	n	%	95% CI	*n*	%	95% CI	*p*-value[a]	*n*	%	95% CI
Sex							0.001			
Female	89	33.3	[27.6–39.0]	439	44.6	[41.5–47.7]		139	40.4	[35.2–45.6]
Male	178	66.7	[61.0–72.4]	546	55.4	[52.3–58.5]		205	59.6	[54.4–64.8]
Age at diagnosis (yrs)							0.476			
0–4	59	22.1	[17.1–27.1]	262	26.6	[23.8–29.4]		127	36.9	[31.8–42.0]
5–8	77	28.8	[23.4–34.3]	257	26.1	[23.3–28.8]		100	29.1	[24.2–33.9]
9–12	68	25.5	[20.2–30.7]	226	22.9	[20.3–25.6]		62	18.0	[13.9–22.1]
13–15	63	23.6	[18.5–28.7]	240	24.4	[21.7–27.1]		55	16.0	[12.1–19.9]
Time since diagnosis (yrs)							0.675			
>10–20	128	47.9	[41.9–54.0]	471	47.8	[44.7–50.9]		70	20.3	[16.1–24.6]
21–30	126	47.2	[41.2–53.2]	450	45.7	[42.6–48.8]		247	71.8	[67.0–76.6]
>30	13	4.9	[2.3–7.5]	64	6.5	[5.0–8.0]		27	7.8	[5.0–10.7]
Current age (yrs)							0.166			
<26	72	27.0	[21.6–32.3]	319	32.4	[29.5–35.3]		70	20.3	[16.1–24.6]
26–30	92	34.5	[28.7–40.2]	313	31.8	[28.9–34.7]		110	32.0	[27.0–36.9]
31–34	57	21.3	[16.4–26.3]	202	20.5	[18.0–23.0]		96	27.9	[23.1–32.7]
35+	46	17.2	[12.7–21.8]	151	15.3	[13.1–17.6]		68	19.8	[15.5–24.0]
Diagnosis							0.562			
Leukaemia	88	33.0	[27.3–38.6]	379	38.5	[35.4–41.5]		158	45.9	[40.6–51.2]
Hodgkin's disease	30	11.2	[7.4–15.0]	87	8.8	[7.1–10.6]		18	5.2	[2.9–7.6]
Non-Hodgkin lymphomas	36	13.5	[9.4–17.6]	110	11.2	[9.2–13.1]		41	11.9	[8.5–15.4]
CNS tumours	30	11.2	[7.4–15.0]	108	11.0	[9.0–12.9]		18	5.2	[2.9–7.6]
Neuroblastoma	12	4.5	[2.0–7.0]	38	3.9	[2.7–5.1]		17	4.9	[2.6–7.2]
Retinoblastoma	4	1.5	[0.0–3.0]	19	1.9	[1.1–2.8]		5	1.5	[0.2–2.7]
Renal tumours	12	4.5	[2.0–7.0]	56	5.7	[4.2–7.1]		25	7.3	[4.5–10.0]
Malignant bone tumours	9	3.4	[1.2–5.5]	46	4.7	[3.4–6.0]		10	2.9	[1.1–4.7]
Soft tissue sarcomas	20	7.5	[4.3–10.7]	49	5.0	[3.6–6.3]		23	6.7	[4.0–9.3]
Other[b]	14	5.2	[2.6–7.9]	43	4.4	[3.1–5.6]		14	4.1	[2.0–6.2]
Langerhans cell histiocytosis	12	4.5	[2.0–7.0]	50	5.1	[3.7–6.4]		15	4.4	[2.2–6.5]
Therapy							0.149			
Surgery only	23	8.6	[5.2–12.0]	79	8.0	[6.3–9.7]		8	2.3	[0.7–3.9]
Chemotherapy[c]	118	44.2	[38.2–50.2]	501	50.9	[47.7–54.0]		201	58.4	[53.2–63.7]
Radiotherapy[d]	126	47.2	[41.2–53.2]	405	41.1	[38.0–44.2]		135	39.2	[34.1–44.4]
Bone marrow transplant	9	3.4	[1.2–5.5]	36	3.7	[2.5–4.8]		6	1.7	[0.4–3.1]
Language							0.005			
German	179	67.0	[61.4–72.7]	748	75.9	[73.3–78.6]		270	78.5	[74.1–82.9]
French	74	27.7	[22.3–33.1]	212	21.5	[19.0–24.1]		72	20.9	[16.6–25.3]
Italian	14	5.2	[2.6–7.9]	25	2.5	[1.6–3.5]		2	0.6	[–0.2–1.4]

Abbreviations: CNS, Central Nervous System; yrs, years.

[a] Chi square and trend test comparing non-responders with responders.

[b] includes hepatic tumours, germ cell tumours and other rare tumours.

[c] *Chemotherapy*: survivor had chemotherapy and may have had surgery but no radiotherapy.

[d] *Radiotherapy*: survivor had radiotherapy and may have had chemotherapy and surgery.

4. Discussion

This nationwide long-term follow-up study found that only 19% of long-term survivors of childhood cancer had regular follow-up visits, with an additional 41% reporting irregular visits. Although the proportion of survivors attending follow-up increased with severity of late effects, only a minority of those judged as needing long-term follow-up at a previous medical examination still attended regular visits a decade later. In the past year 34% of survivors had sought medical help for a problem related to their former disease, most often from a general practitioner.

4.1. *Comparison of the proportion of follow-up attendees with other countries*

Direct comparisons are difficult since studies on use of follow-up included differing times elapsed since diagnosis (Appendix II: Table 4).[11–13,22] Nevertheless, similarly low proportions attended follow-up in other countries: in the UK

Table 2 – Baseline characteristics of survivors assessed at time of diagnosis, predicting use of follow-up.

	Follow-up attendees (n = 588)		Non-follow-up attendees (n = 394)		OR unadjusted	95% CI	p-value*	OR[a] adjusted	95% CI	p-value*
	n	%	n	%						
Sex							0.004			0.014
Male	303	55.8	240	44.5	1.00			1.00		
Female	285	64.9	154	35.1	1.47	[1.13–1.90]		1.42	[1.07–1.87]	
Age at diagnosis (yrs)							<0.001			0.017
0–4	143	54.8	118	45.4	1.00			1.00		
5–8	134	52.3	122	47.9	0.91	[0.64–1.28]		0.77	[0.52–1.12]	
9–12	141	62.4	85	37.6	1.37	[0.95–1.97]		1.06	[0.69–1.61]	
>12	170	71.1	69	29.2	2.03	[1.40–2.95]		1.50	[0.96–2.35]	
Time since diagnosis (yrs)							<0.001			<0.001
11–20	316	67.2	154	32.9	1.00			1.00		
21–30	233	52.0	215	48.2	0.53	[0.40–0.69]		0.48	[0.36–0.65]	
>30	39	60.9	25	39.1	0.76	[0.44–1.30]		0.59	[0.33–1.07]	
Diagnosis							<0.001			0.085
Leukaemia	216	57.3	161	43.0	1.00			1.00		
Hodgkin's disease	66	75.9	21	24.1	2.34	[1.38–3.99]		1.30	[0.70–2.39]	
Non-Hodgkin's lymphoma	61	55.5	49	44.5	0.93	[0.60–1.42]		0.81	[0.51–1.28]	
CNS tumours	73	67.6	35	32.4	1.55	[0.99–2.44]		1.33	[0.75–2.35]	
Embryonal tumours[b]	81	57.0	61	43.0	0.99	[0.67–1.46]		1.20	[0.78–1.84]	
Bone tumours/STS	67	70.5	28	29.5	1.78	[1.10–2.90]		1.38	[0.82–2.32]	
Other[c]	24	38.1	39	62.5	0.46	[0.27–0.79]		0.54	[0.29–0.99]	
Therapy							<0.001			<0.001
Surgery only	33	42.3	45	58.2	1.00			1.00		
Chemotherapy[d]	270	53.9	231	46.1	1.59	[0.98–2.58]		2.12	[1.15–3.92]	
Radiotherapy[e]	285	70.7	118	29.6	3.29	[2.00–5.42]		3.81	[2.09–6.94]	
Relapse							<0.001			0.001
No	473	57.3	353	42.8	1.00			1.00		
Yes	115	73.7	41	27.2	2.09	[1.43–3.07]		1.92	[1.28–2.89]	
Parents' education[f]							0.973			
Compulsory schooling	59	60.8	38	39.2	1.02	[0.65–1.60]				
Vocational training	256	60.4	168	39.6	1.00					
Upper secondary[g]	145	58.2	104	41.8	0.91	[0.67–1.26]				
University education	61	61.6	38	38.4	1.05	[0.67–1.65]				
Immigration[h]							0.093			
No	437	58.2	314	41.8	1.00					
Yes	135	64.6	74	35.4	1.31	[0.95–1.80]				

Abbreviations: OR, odds ratio; CI, confidence interval; yrs, years; CNS, Central Nervous System; STS, Soft tissue sarcomas.
Row percentages are presented.

* Global p-value.

[a] Adjusted for all factors listed except parent's education and immigration.

[b] Includes neuroblastoma, retinoblastoma, Wilms tumour, liver tumour and germ cell tumour.

[c] Includes epithelial neoplasms, malignant melanomas, unspecified malignant tumours and Langerhans cell histiocytosis.

[d] Some chemotherapy but no radiotherapy.

[e] Some radiotherapy (may have had chemotherapy and surgery).

[f] The highest completed education of either father or mother.

[g] Upper secondary education includes high school, teachers training colleges, technical colleges and upper vocational education.

[h] Does not have a Swiss passport or has received the Swiss passport after date of birth or parents originate from another country.

35% of survivors were still on regular long-term hospital follow-up 5 or more years off treatment.[11] In the Childhood Cancer Survivor Study (CCSS) from the US, 32% reported ongoing care for their prior cancer.[12] Also in Sweden, only 40% of long-term survivors had recently attended or were scheduled for a follow-up.[23] These proportions are low considering the high cumulative incidence of chronic health conditions 25 years after the diagnosis with two-thirds of survivors suffering from late effects, and are not in accordance with recommendations.[2,4] Nevertheless, similar to the findings of the recent CCSS study,[12] the majority of Swiss survivors received some form of medical care in the past year.

In our study, the proportions of survivors having follow-up increased with severity of their late effects. In Switzerland

Table 3 – Current characteristics of survivors assessed at the time of survey, associated with follow-up.

	Follow-up attendees (n = 588)		Non-follow-up attendees (n = 394)		OR unadjusted	95% CI	p-value*	OR[a] adjusted	95% CI	p-value*
	n	%	n	%						
Health status							<0.001			0.229
Excellent/very good	356	54.0	303	46.1	1.00			1.00		
Good	193	71.0	79	29.0	2.08	[1.54–2.82]		1.40	[0.95–2.05]	
Fair/poor	29	70.7	12	29.3	2.06	[1.03–4.10]		1.15	[0.46–2.87]	
Bodily pain							<0.001			0.113
None	378	54.9	310	45.1	1.00			1.00		
Very mild	91	75.2	30	24.8	2.49	[1.60–3.86]		1.80	[1.10–2.95]	
Mild	49	64.5	27	35.5	1.49	[0.91–2.44]		1.09	[0.59–1.98]	
Moderate/severe	55	70.5	23	29.5	1.96	[1.18–3.26]		1.33	[0.68–2.59]	
Self-reported late effects							<0.001			<0.001
No	300	49.4	213	48.1	1.00			1.00		
Yes	281	76.4	87	23.8	3.31	[2.48–4.41]		2.50	[1.77–3.53]	
Received medical record or checklist							0.001			0.074
No	473	57.3	353	42.8	1.00			1.00		
Yes	115	73.7	41	27.2	2.09	[1.43–3.07]		1.37	[0.97–1.94]	
Sought for further information							<0.001			<0.001
No	230	51.9	213	48.1	1.00			1.00		
Yes	308	67.8	146	32.2	1.95	[1.49–2.56]		1.78	[1.31–2.40]	
Partner							0.192			
No	437	58.2	314	41.8	1.00					
Yes	135	64.6	74	35.4	0.84	[0.64–1.09]				
Own education							0.255			
Compulsory schooling	44	68.8	20	31.3	1.65	[0.94–2.89]				
Vocational training	248	57.1	186	42.9	1.00					
Upper secondary[b]	154	59.9	103	40.1	1.12	[0.82–1.53]				
University education	92	65.2	49	34.8	1.41	[0.95–2.09]				

Abbreviations: OR, odds ratio; CI, confidence interval.
Row percentages are presented.
* Global p-value.
[a] Adjusted for all factors listed and for sex, age at diagnosis, time since diagnosis and diagnosis.
[b] Upper secondary education includes high school, teachers training colleges, technical colleges and upper vocational education.

and elsewhere an annual follow-up of all survivors might neither be possible nor necessary. A relatively simple three-level model of risk-stratification based on diagnosis and treatment has therefore been proposed.[24] Survivors with moderate or severe late effects are likely to profit from medical care in a regular follow-up. Similar to our findings, a recent report from the CCSS showed a higher probability to receive risk-based care for survivors with a severe, life threatening or disabling chronic health condition.[12] However, in our study, a substantial proportion of survivors, even those with moderate or severe late effects, which would require regular follow-up or therapy, reported to not attend 10 years later.

4.2. *Factors associated with follow-up*

In accordance with studies from other countries, likelihood to attend follow-up decreased with longer time since diagnosis,[13,22] younger age at diagnosis and older age at interview.[12] This is in contrast with other findings showing that the cumulative incidence of adverse health conditions amongst survivors increases with time and does not appear to plateau.[4] Beyond 45 years from diagnosis survivors were still at increased risk of premature death, due to second primary cancers, circulatory, cardiac and respiratory causes.[25] Similar to previous studies, follow-up was more common in children with high risk treatment including radiotherapy.[12,13,22] but not associated with initial diagnosis after adjusting for treatment.[26,27] Survivors from bone tumours were more likely to have seen an oncologist than survivors of leukaemia.[13] In contrast with other studies, we found that females were more likely to attend.[11,12,23,26,27] Survivors' educational background was not associated with follow-up attendance, as in other studies.[12,22]

Considering all this, it seems that problems associated with long-term follow-up are seen in different continents and different health care models, including health care systems that should guarantee equal access to treatment to all patients, including the poorest. This suggests that characteristics of

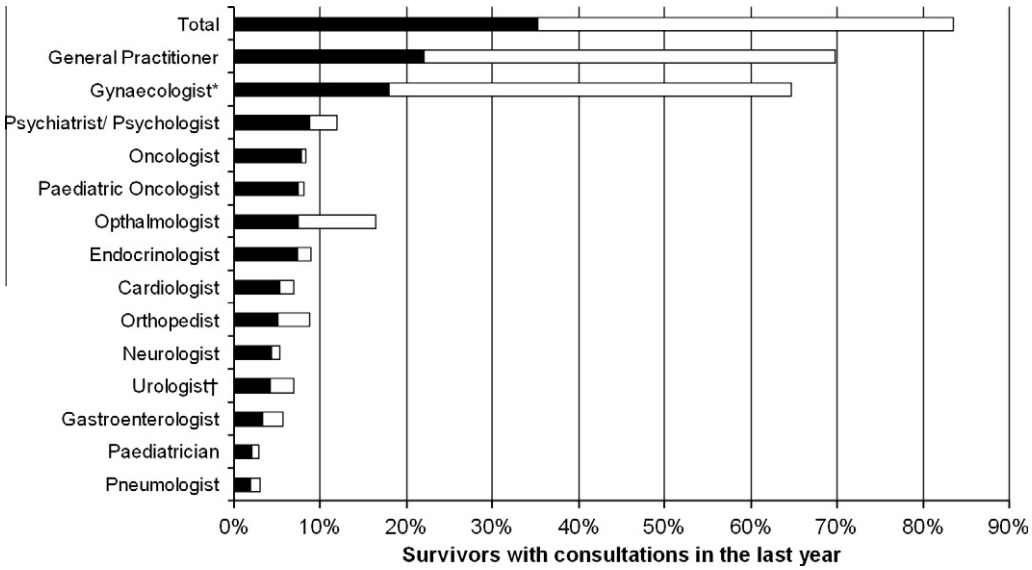

Fig. 2 – Health care professionals involved in long-term follow-up of childhood cancer survivors in Switzerland: consultations in the past year (n = 914). *, Only females included, †, only males included; ■, survivors with cancer-related visits at doctors (% of all); □, survivors with all visits to doctors (% of all).

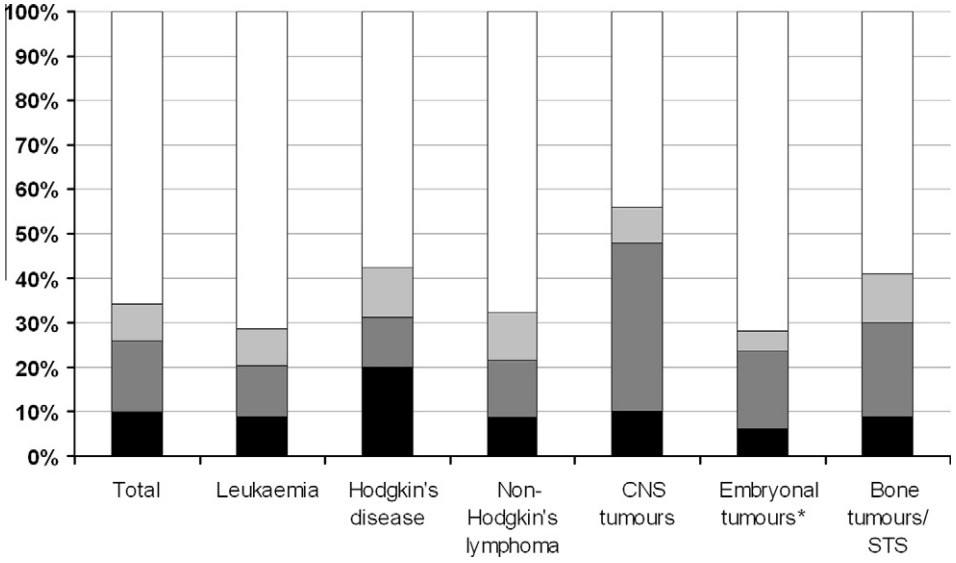

Fig. 3 – Cancer-related visits in the past year at health professionals relevant for different follow-up care models by diagnostic groups (n = 914). *, Includes neuroblastoma, retinoblastoma, Wilms tumour, liver tumour and germ cell tumour; □, no cancer related visit, ▫, visits to the General practitioner only; ▪, visits to multiple medical specialists; ■, visits to the paediatric or adult oncologist.

the health systems may not be the most important barriers to access of follow-up for young adult survivors of childhood cancer.

Insufficient knowledge of survivors about their diagnosis, treatment and potential late consequences has been described as a major barrier to follow-up.[28,29] We found that only 25% of study participants had ever received a written document with recommendations for future care. In addition, survivors' own interest in their disease, as shown by active search for further information, was strongly associated with follow-up attendance. Physicians should be aware of their role as important information sources for long-term survivors. However, results also show that the Internet played an important role. Websites with evidence-based information specifically for survivors and ideally maintained by professionals therefore need to be developed.

4.3. *Health professionals involved in follow-up*

Different models have been proposed to facilitate the transition from paediatric to the adult care in childhood cancer survivors.[21] Our results showed that similar to the UK and US, general practitioners were frequently involved in long-term care of childhood cancer survivors and saw the largest num-

ber of patients (n = 164, 26%).[11,22] Thus, a follow-up model with general practitioners as gatekeepers transferring patients to specialists may cover best the needs of a majority of patients. However, preferences and views of survivors and physicians, as well as specific features of the health system need to be considered. A UK study for instance reported that survivors highly appreciated clinic-based cancer-specific care.[30]

Many different health care professionals were involved in long-term follow-up of childhood cancer survivors in our study, but contrary to recommendations paediatric oncologists played a modest role.[5,6] Survivors of Hodgkin's lymphoma often consulted oncologists, whilst brain tumour survivors went to endocrinologists, neurologists, ophthalmologists and psychologists. These consultations with many different specialists highlight the need for close collaboration between physicians. Specialised multidisciplinary survivor programmes may cover these needs best.[31]

4.4. *Methodological considerations*

The SCCSS is a nationwide representative cohort study investigating long-term outcome of childhood cancer in Switzerland. The following limitations have to be considered: first, our data are self-reported. Survivor's opinions on whether or not health visits in the past year were cancer-related might not always correspond with the opinion of their health care providers. Second, the medical examination of the subsample of study participants had been more than a decade before the current survey, and may not be representative for the entire study population. Some formerly asymptomatic patients may have developed late effects since, and severity grades may have increased rather than decreased over time as transient problems were not coded as late effects and severe conditions were unlikely to be improved by therapy. Third, our study design, where follow-up care and health outcomes were assessed at the same survey, does not allow to draw conclusions as to whether frequency or type of follow-up does influence incidence and severity of subsequently occurring late effects. This important question needs to be studied in a truly prospective design. A major strength of the study is the population-based design, and the fact that we also assessed information on health care providers. The response rate was high, and our results should be representative for childhood cancer survivors in Switzerland, with some caution for children diagnosed before 1990 when the Swiss Childhood Cancer Registry was less complete.[32] Variation in the response rate across treatment centres may reflect cultural differences in the French and German speaking part of Switzerland rather than differences in diagnosis or treatment of patients.

5. Conclusion

The study gave an overview on medical care of childhood cancer survivors in Switzerland and provides a basis for future research. Less than a fifth of survivors attended follow-up regularly and about a third irregularly. Strikingly, only 60% of survivors diagnosed with moderate late effects 10 years ago, judged as requiring continued follow-up, had really attended. This contrasts with recommendations and reasons for this remain unclear. In future studies, we plan to assess opinions, preferences and needs of survivors and health care providers as a basis for developing a national follow-up programme tailored to the needs and preferences of those concerned.

Sources of support

Gisela Michel and Claudia Kuehni were funded by the Swiss National Science Foundation (G.M.: Ambizione Grant PZ00P3_121682/1; C.K.: PROSPER Grant 3233-069348) and Cornelia Rebholz by a scholarship of the Bernese Cancer League.

Conflict of interest statement

None declared.

Acknowledgements

This study was supported by the Swiss Cancer League (Grant Nos. KLS-01605-10-2004 and KLS-2215-02-2008), the Wyeth Foundation for the Health of Children and Adolescents and the Foundation for the Fight against Cancer. The funding agencies had no role in the design of this study, data collection, analysis and interpretation of the results, or the writing of the manuscript. We thank Humera Khan for help with proofreading the manuscript.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.ejca.2010.09.017.

REFERENCES

1. Gatta G, Zigon G, Capocaccia R, et al. Survival of European children and young adults with cancer diagnosed 1995–2002. *Eur J Cancer* 2009;**45**(6):992–1005.
2. Hewitt M, Weiner SL, Simone JV. *National Research Council. Childhood cancer survivorship. Improving care and quality of life*. Washington, DC: National Cancer Policy Board; 2003.
3. Geenen MM, Cardous-Ubbink MC, Kremer LCM, et al. Medical assessment of adverse health outcomes in long-term survivors of childhood cancer. *JAMA* 2007;**297**(24):2705–15.
4. Oeffinger KC, Mertens AC, Sklar CA, et al. Chronic health conditions in adult survivors of childhood cancer. *N Engl J Med* 2006;**355**(15):1572–82.
5. von der Weid N, Beck D, Caflisch U, et al. Standardized assessment of late effects in long-term survivors of childhood cancer in Switzerland. *Int J Pediatric Hematol/Oncol* 1996;**3**:483–90.
6. von der Weid N, Wagner HP. Organisation of follow-up in paediatric oncology. *Eur J Cancer* 2003;**39**(8):1150–4.
7. Skinner R, Wallace WH, Levitt G. Long-term follow-up of children treated for cancer: why is it necessary, by whom, where and how? *Arch Dis Child* 2007;**92**(3):257–60.

8. Scottish Intercollegiate Guidelines Network (SIGN). *Long term follow-up of survivors of childhood cancer*. A national clinical guideline, No. 76. www.sign.ac.uk/pdf/sign76.pdf>; 2004; updated March 2005.
9. Children's Oncology Group. *Long-term follow-up guidelines for survivors of childhood, adolescent, and young adult cancers*, version 3 ed. www.survivorshipguidelines.org; 2008.
10. National Cancer Institute. *Late effects of treatment for childhood cancer (PDQ®) Health Professional Version*. www.cancer.gov/cancertopics/pdq/treatment/lateeffects/healthprofessional; 2008.
11. Taylor A, Hawkins M, Griffiths A, et al. Long-term follow-up of survivors of childhood cancer in the UK. *Pediatr Blood Cancer* 2004;**42**(2):161–8.
12. Nathan PC, Greenberg ML, Ness KK, et al. Medical care in long-term survivors of childhood cancer: a report from the childhood cancer survivor study. *J Clin Oncol* 2008;**26**(27):4401–9.
13. Shaw AK, Pogany L, Speechley KN, et al. Use of health care services by survivors of childhood and adolescent cancer in Canada. *Cancer* 2006;**106**(8):1829–37.
14. Michel G, von der Weid NX, Zwahlen M, et al. The Swiss Childhood Cancer Registry: rationale, organisation and results for the years 2001–2005. *Swiss Med Wkly* 2007;**137**(35–):502–9.
15. Michel G, von der Weid NX, Zwahlen M, et al. Incidence of childhood cancer in Switzerland: the Swiss childhood cancer registry. *Pediatr Blood Cancer* 2008;**50**:46–51.
16. von der Weid N. Late effects in long-term survivors of ALL in childhood: experiences from the SPOG late effects study. *Swiss Med Wkly* 2001;**131**(13–14):180–7.
17. Steliarova-Foucher E, Stiller C, Lacour B, Kaatsch P. International Classification of Childhood Cancer, third edition. *Cancer* 2005;**103**(7):1457–67.
18. Robison LL, Mertens AC, Boice JD, et al. Study design and cohort characteristics of the Childhood Cancer Survivor Study: a multi-institutional collaborative project. *Med Pediatr Oncol* 2002;**38**(4):229–39.
19. Hawkins MM, Lancashire ER, Winter DL, et al. The British Childhood Cancer Survivor Study: objectives, methods, population structure, response rates and initial descriptive information. *Pediatr Blood Cancer* 2008;**50**: 1018–25.
20. Ware JE, Kosinski, M., Dewey, JE. *How to score version 2 of the SF-36®Health Survey*. Lincoln (RI): QualityMetric Incorporated; 2000.
21. Aslett H, Levitt G, Richardson A, Gibson F. A review of long-term follow-up for survivors of childhood cancer. *Eur J Cancer* 2007;**43**(12):1781–90.
22. Oeffinger KC, Mertens AC, Hudson MM, et al. Health care of young adult survivors of childhood cancer: a report from the Childhood Cancer Survivor Study. *Ann Fam Med* 2004;**2**(1):61–70.
23. Arvidson J, Soderhall S, Eksborg S, Bjork O, Kreuger A. Medical follow-up visits in adults 5–25 years after treatment for childhood acute leukaemia, lymphoma or Wilms' tumour. *Acta Paediatr* 2006;**95**(8):922–8.
24. Wallace WHB, Blacklay A, Eiser C, et al. Developing strategies for long term follow up of survivors of childhood cancer. *BMJ* 2001;**323**(7307):271–4.
25. Reulen RC, Winter DL, Frobisher C, et al. Long-term cause-specific mortality among survivors of childhood cancer. *JAMA* 2010;**304**(2):172–9.
26. Klosky JL, Cash DK, Buscemi J, et al. Factors influencing long-term follow-up clinic attendance among survivors of childhood cancer. *J Cancer Surviv* 2008;**2**(4):225–32.
27. Johnson R, Horne B, Feltbower RG, Butler GE, Glaser AW. Hospital attendance patterns in long term survivors of cancer. *Arch Dis Child* 2004;**89**(4):374–7.
28. Kadan-Lottick NS, Robison LL, Gurney JG, et al. Childhood cancer survivors' knowledge about their past diagnosis and treatment: Childhood Cancer Survivor Study. *JAMA* 2002;**287**(14):1832–9.
29. Zebrack BJ, Eshelman DA, Hudson MM, et al. Health care for childhood cancer survivors: insights and perspectives from a Delphi panel of young adult survivors of childhood cancer. *Cancer* 2004;**100**(4):843–50.
30. Michel G, Greenfield DM, Absolom K, et al. Follow-up care after childhood cancer: survivors' expectations and preferences for care. *Eur J Cancer* 2009;**45**(9):1616–23.
31. Oeffinger KC, McCabe MS. Models for delivering survivorship care. *J Clin Oncol* 2006;**24**(32):5117–24.
32. Adam M, von der Weid NX, Michel G, et al. Access to specialized pediatric cancer care in Switzerland. *Pediatr Blood Cancer* 2010;**54**(5):721–7.