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Adolescents and young adults with cancer in Switzerland: a large retrospective single-centre cohort analysis of key care pathways and outcomes by sex and age

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Summary

STUDY AIMS: Adolescents and young adults with cancer represent a distinct population facing unique challenges. While large registry-based studies exist, they often overlook aspects of local care. This study aimed to describe the demographic and clinical characteristics of adolescent and young adult patients with cancer treated at a Swiss tertiary centre, with particular focus on cancer type, sex, age variations, fertility preservation, palliative care, clinical trial participation and survival outcomes.

PATIENTS AND METHODS: A retrospective single-centre study was conducted using electronic medical records of patients aged 15–39 years treated for an initial cancer diagnosis at University Hospital Bern (Inselspital) between 2015 and 2021. Descriptive statistics were used to summarise patient and cancer characteristics, and group differences were assessed using K-sample equality of medians and chi-squared tests. Kaplan-Meier plots evaluated 5-year survival, and logistic regression identified survival predictors.

RESULTS: The cohort included 395 patients (67% male), with a median age of 27 years. The most frequent diagnoses were Hodgkin lymphoma (25%) and testicular cancer (24%), followed by non-Hodgkin lymphoma, leukaemia and central nervous system tumours (each 11%). Median time from diagnosis to first treatment was 13 days. Fertility consultations were held in 58% of cases (higher among males: 61% vs 50%). Clinical trial participation was 29%. Five-year survival was 84% overall, but significantly lower in older patients and those with metastatic disease.

CONCLUSIONS: This is the first study to report on adolescent and young adult cancer patients at a Swiss tertiary centre. While overall survival was favourable, disparities were observed based on age, diagnosis and disease stage. These findings underscore the need for targeted improvements in palliative care services, fertility counselling and trial inclusion for adolescent and young adult cancer patients.

Introduction

Adolescents and young adults, commonly defined as ages 15–39 years, with cancer constitute a distinct group of patients differing from children and older adults in terms of incidence, cancer biology, management needs and prognosis [1, 2]. An estimated 120,000 adolescent and young adult cancers were diagnosed in 2020 in Europe, corresponding to 5% of all new cases of cancer [3, 4]. Globally, among all people in this age group, cancer is the fourth leading cause of death [3, 4]. Cancer incidence among adolescents and young adults has increased since 1975 [5]. Cancer in adolescent and young adult patients more often affects females (60%) than cancer both in children under 15 and in adults aged 55 and older which predominantly affects males [6–9]. Between 2010 and 2019, a total of 16,885 adolescent and young adult cancer diagnoses were recorded in Swiss cancer registries, of which 56% were in females [10].

Cancer type in adolescents and young adults varies by sex: males have a higher prevalence of thyroid cancer (14%), testicular cancer (9%) and leukaemia (8%), while females have a higher prevalence of breast cancer (29%), thyroid cancer (21%) and cervical cancer (12%) [11–13]. Survival is overall high, with cancer registry data from 29 countries among 700,000 adolescents and young adults over the period 2010–2024 reporting 5-year survival for all cancers of 84% [3]. The best and worst outcomes were for Hodgkin lymphoma (95%) and acute lymphoblastic leukaemia (59%), respectively. Although an older series from the Surveillance, Epidemiology, and End Results (SEER) registry in the USA between 1975 and 2002 reported that survival rates among adolescents and young adults improved less (average annual percent change [AAPC]: 4.6%) over the time period than those of children (AAPC: 5.8%) [14], more recent data showed similar AAPCs for the period 2000–2014 in survival for adolescents and young adults (0.33%) and for children (0.36%) [15]. There is conflicting data on whether the outcomes are worse for male or female patients [12, 16].

While extensive data exists for cancer among children and older adults, knowledge gaps remain for the adolescent and young adult population. Most studies describing cancer in adolescents and young adults are based on registry data, which is excellent for describing epidemiological trends in prevalence, incidence and prognosis; however, information is lacking for local disease burden and care pathways, such as supportive care referrals for fertility preservation and palliative care. Few clinical studies exist, with most focusing on a single cancer type [17, 18] or including only limited data [19–22]. The present study aimed to describe the demographics and clinical characteristics of adolescent and young adult patients treated at University Hospital Bern (Inselspital) over a recent 6-year period to present a holistic picture of this population. It particularly focused on cancer type, sex, age variations, fertility preservation, palliative care, clinical trial participation and survival outcomes.

Methods

Study design and participants

This was a retrospective single-centre cohort study using data extracted from electronic medical records from University Hospital Bern, a tertiary referral centre covering the region of Bern, the capital of Switzerland, with around 1 million inhabitants. Individuals aged 15 to 39 at time of diagnosis treated for any tumour at the adult outpatient oncology clinic at University Hospital Bern between 1 January 2015 and 31 December 2021, and who had signed the Hospital's general informed consent form (thereby allowing study entry) were included.

The ethics committee of Bern waived the need for approval for this study (2022-00474).

Patients with cancer diagnosed below the age of 15 but who presented with a relapse as adolescents and young adults were excluded, as were patients who started definitive cancer treatment at another centre.

Data collection and definitions

Demographic and cancer characteristics were manually extracted from the hospital electronic medical system, IPDOS®, from 3 October to 16 December 2022 using a predefined form. The data was independently reviewed by a second investigator, with discrepancies resolved by consensus and basic plausibility checks performed. Outcomes and key variables were defined a priori based on the study objectives. Information on vital status was collected up to 22 September 2024. From the collected information, the following parameters were calculated: age at diagnosis, body mass index (BMI), time from diagnosis (or, if missing, referral date) to first consultation at University Hospital Bern, and 5-year survival.

Statistical analysis

Descriptive statistics were used to depict patient and cancer characteristics. Characteristics stratified by age, sex and major diagnosis group are shown where datasets include at least 10 patients, to preserve anonymity. Differences in age, BMI, first treatment, clinical trial participation and 5-year survival by major diagnosis group were tested using K-sample equality of medians for non-normally distributed variables and chi-squared for categorical variables. Kaplan-Meier plots were used to examine 5-year survival. Prognostic factors associated with survival were analysed by adjusted logistic regression analysis, with survival five years after follow-up used as the dependent variable and age at diagnosis, sex and major diagnosis group as independent variables. In a second adjusted model, we included a category of local versus advanced/metastatic disease at diagnosis for

tumours where this categorisation is applicable, including testicular cancer, Hodgkin lymphoma, non-Hodgkin lymphoma, gastrointestinal cancers, and bone and soft tissue sarcoma. We present both models as the second model only includes a selection of the relevant diagnoses and results from this model cannot be generalised to all adolescents and young adults in our sample. Analyses were performed using Stata for Windows version 18 (StataCorp LLC, College Station, TX, USA).

Results

Of the 718 patients who were seen at our outpatient clinic in the period 2015–2021, we excluded 130 who did not fulfill inclusion criteria (38 who did not grant general consent, 3 in whom documented consent was missing, 89 with benign tumours). Of the remaining 588, we excluded a further 91 patients – 25 first diagnosed below age 15; 66 with missing data for multiple data points, e.g exact diagnosis and treatment type –, resulting in 497 adolescents and young adults with cancer who were treated at University Hospital Bern between January 2015 and December 2021 (table S1 in the appendix). Of these 497, 395 received their definitive cancer treatment at University Hospital Bern and were included in this analysis (264 or 67% were males; median age was 27 years; table 1). Testicular cancer (n = 93 or 24%) and Hodgkin lymphoma (n = 99 or 25%) were the most common diagnoses, followed by non-Hodgkin lymphoma (n = 45 or 11%), leukaemia (n = 45 or 11%) and central nervous system tumours (n = 42 or 11%). Rare cancers (defined as those diagnosed in fewer than five patients in our cohort) are presented in table S2 in the appendix. Excluding testicular and female genital cancers, there was little difference in cancer origin between males and females.

Table 1: Characteristics of included patients (n = 395).

		Male	Female	15–19 y	20–29 y	30–39 y	Total
		n = 264	n = 131	n = 69	n = 205	n = 121	n = 395
		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
BMI at first treatment at University Hospital Bern	<18.5	10 (4%)	11 (8%)	9 (13%)	9 (4%)	3 (2%)	21 (5%)
	18.5–24.9	163 (62%)	87 (66%)	46 (67%)	135 (66%)	69 (57%)	250 (63%)
	25.0–29.9	67 (25%)	19 (15%)	10 (14%)	38 (19%)	38 (31%)	86 (22%)
	≥30	22 (8%)	12 (9%)	3 (4%)	20 (10%)	11 (9%)	34 (9%)
	Unknown	2 (1%)	2 (2%)	1 (1%)	3 (1%)	0	4 (1%)
Diagnosis	Testicular cancer	93 (35%)	0	4 (6%)	56 (27%)	33 (27%)	93 (24%)
	Hodgkin lymphoma	57 (22%)	42 (32%)	31 (45%)	52 (25%)	16 (13%)	99 (25%)
	Non-Hodgkin lymphoma	29 (11%)	16 (12%)	8 (12%)	17 (8%)	20 (17%)	45 (11%)
	Leukaemia	27 (10%)	15 (11%)	10 (14%)	16 (8%)	16 (13%)	42 (11%)
	Central nervous system tumour	20 (8%)	23 (18%)	6 (9%)	24 (12%)	13 (11%)	43 (11%)
	Gastrointestinal tumour	9 (3%)	5 (4%)	0	5 (2%)	9 (7%)	14 (4%)
	Bone and soft tissue tumour	15 (6%)	10 (8%)	5 (7%)	17 (8%)	3 (2%)	25 (6%)
	Breast and female genital tumour	0	5 (4%)	0	1 (0%)	4 (3%)	5 (1%)
	Melanoma and other skin tumour	3 (1%)	0	0	3 (1%)	0	3 (1%)
	Ear-nose-throat tumour	4 (2%)	4 (3%)	2 (3%)	4 (2%)	2 (2%)	8 (2%)
	Urothelial carcinomas	1 (0%)	4 (3%)	2 (3%)	2 (1%)	1 (1%)	5 (1%)
	Other[a]	6 (2%)	7 (5%)	1 (1%)	8 (4%)	4 (3%)	13 (3%)
Days between diagnosis and first treatment at University Hospital Bern, median (IQR) (unknown for n = 16)		14 (7–29)	11 (3–31)	8 (1–18)	14 (7–30)	18 (7–44)	13 (6–30)
Included in clinical trial		71 (27%)	42 (32%)	21 (30%)	42 (20%)	50 (41%)	113 (29%)
Fertility consultation		162 (61%)	66 (50%)	40 (58%)	129 (63%)	59 (49%)	228 (58%)
Follow-up in years, median (IQR)		8.0(5.7–10.7)	9.2(6.3–12.3)	11.3(8.0–17.3)	9.0(6.6–11.6)	6.5(4.6–8.5)	8.4(5.8–11.3)
5-year survival (n = 336[b])		189 (85%)	94 (82%)	61 (95%)	159 (86%)	63 (72%)	283 (84%)
Palliative care consultation among patients who died (n = 60)		16 (46%)	15 (60%)	1 (20%)	17 (59%)	13 (50%)	31 (52%)
Years between diagnosis and palliative care consultation (n = 31), median (IQR)		1.3 (0.6–2.1)	2.0 (1.1–3.1)	11.3	1.7 (1.3–2.9)	0.9 (0.5–2.1)	1.6 (0.8–2.2)

a Other diagnoses described in detail in table S2 in the appendix.
[b] 5-year survival calculated for 336 who were followed up for at least five years. P-values calculated for test of equal medians and chi-squared for equal proportions.
BMI: body mass index; IQR: interquartile range.

The median time between diagnosis and first treatment was 13 days (interquartile range [IQR]: 6–30). The median follow-up overall was 8.4 years (5.8–11.3). Clinical trial participation was recorded for 29% (n = 113), with a higher participation rate among patients aged 30–39 (41% or n = 50) than those aged 15–19 years (30% or n = 21) and 20–29 years (20% or n = 42). Furthermore, trial participation was most common among patients with leukaemia, Hodgkin lymphoma and non-Hodgkin lymphoma and least common for testicular cancer and bone and soft tissue sarcoma (table 2). A fertility consultation with a specialised service was documented for 58% (n = 228) of patients (61% of males or n = 162; 50% of females or n = 66). The outcome of consultations is presented in figure 1; a greater proportion of females (26% or n = 17) than males (8% or n = 13) rejected fertility preservation.

Figure 1: Fertility preservation among patients who had a fertility consultation (n = 228).

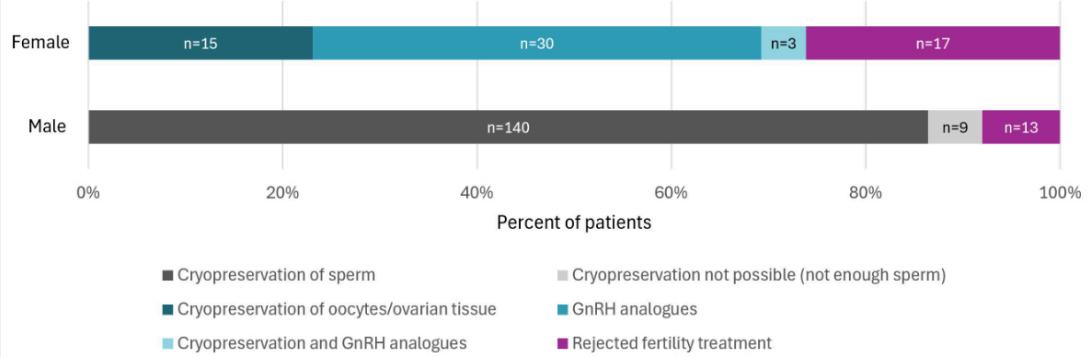


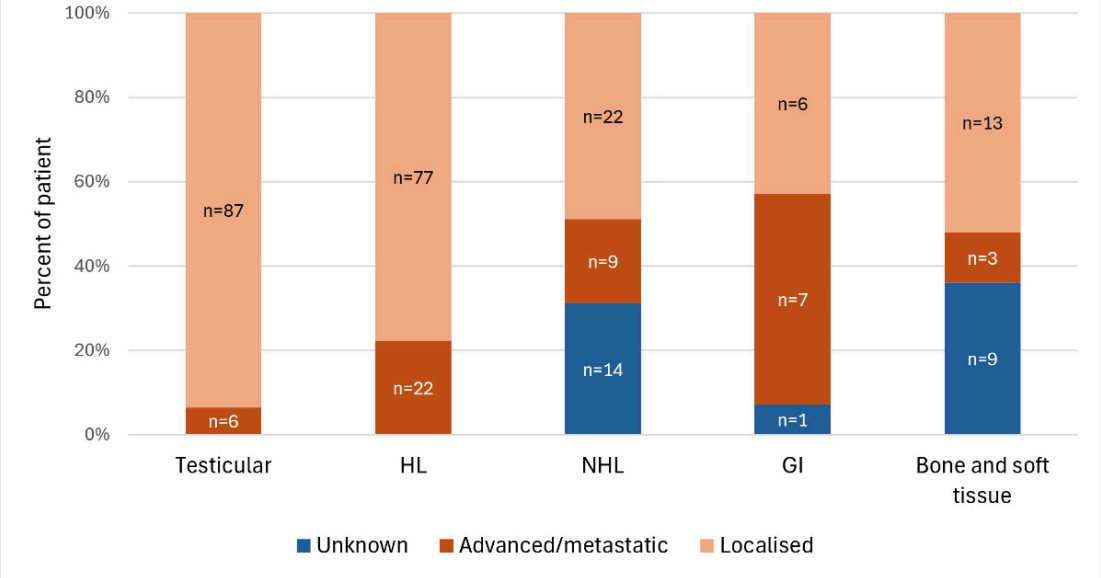
Table 2: Diagnostic, treatment and outcome characteristics by major diagnosis group (n = 395).

		Testicular cancer	HL	NHL	Leukaemia	CNS	Bone, soft tissue tumour	Gastrointestinal tumour	Other	p-value
		n = 93	n = 99	n = 45	n = 42	n = 43	n = 25	n = 14	n = 34	
Age at diagnosis, median (IQR)		28 (23–31)	24 (20–29)	29 (24–32)	26 (20–32)	27 (23–31)	24 (20–27)	30 (30–33)	27 (23–31)	<0.001
BMI, median (IQR)		24 (22–27)	22 (20–24)	23 (21–26)	23 (21–27)	23 (21–27)	22 (19–25)	22 (20–25)	22 (19–25)	0.026
First treatment (categories not mutually exclusive)	Systemic (Chemotherapy / Targeted therapy / Immunotherapy)	8 (9%)	91 (92%)	40 (89%)	42 (100%)	7 (16%)	8 (57%)	12 (48%)	9 (26%)	<0.001
	Radiotherapy	0	1 (1%)	0	0	6 (14%)	2 (14%)	2 (8%)	4 (12%)	<0.001
	Surgery	85 (91%)	4 (4%)	1 (2%)	0	31 (72%)	5 (36%)	12 (48%)	19 (56%)	<0.001
	Wait and see[c]	0	2 (2%)	3 (7%)	0	0	0	0	3 (9%)	0.051
Clinical trial participation		15 (16%)	39 (39%)	17 (38%)	22 (52%)	8 (19%)	2 (8%)	3 (21%)	7 (21%)	<0.001
Follow-up in years, median (IQR)		8.1 (6.2–10.1)	9.9 (6.1–15.9)	8.6 (5.0–10.7)	8.8 (5.5–10.0)	7.9 (5.5–9.8)	8.6 (6.2–10.8)	7.2 (5.7–8.3)	7.5 (5.9–10.9)	0.066
5-year survival among adolescents and young adults followed at least 5 years (n = 336[d])		76 (99%)	83 (98%)	30 (88%)	25 (71%)	23 (64%)	19 (83%)	7 (50%)	20 (63%)	<0.001

[a] Others include breast and female genital cancers, melanoma and other skin cancers, ear-nose-throat cancers, urothelial carcinomas and others (see table S3 in the appendix).
[b] 5-year survival calculated for 304 who were followed up for at least five years.
c "Wait and see" was noted in 5 patients of whom 2 later received chemotherapy. Among the 3 patients who did not receive treatment, two had NHL stage 1 and one had HL stage 1.
d P-value calculated for test of equal medians and chi-squared for equal proportions.
BMI: body mass index; CNS: central nervous system; HL: Hodgkin lymphoma; IQR: interquartile range; NHL: non-Hodgkin lymphoma.

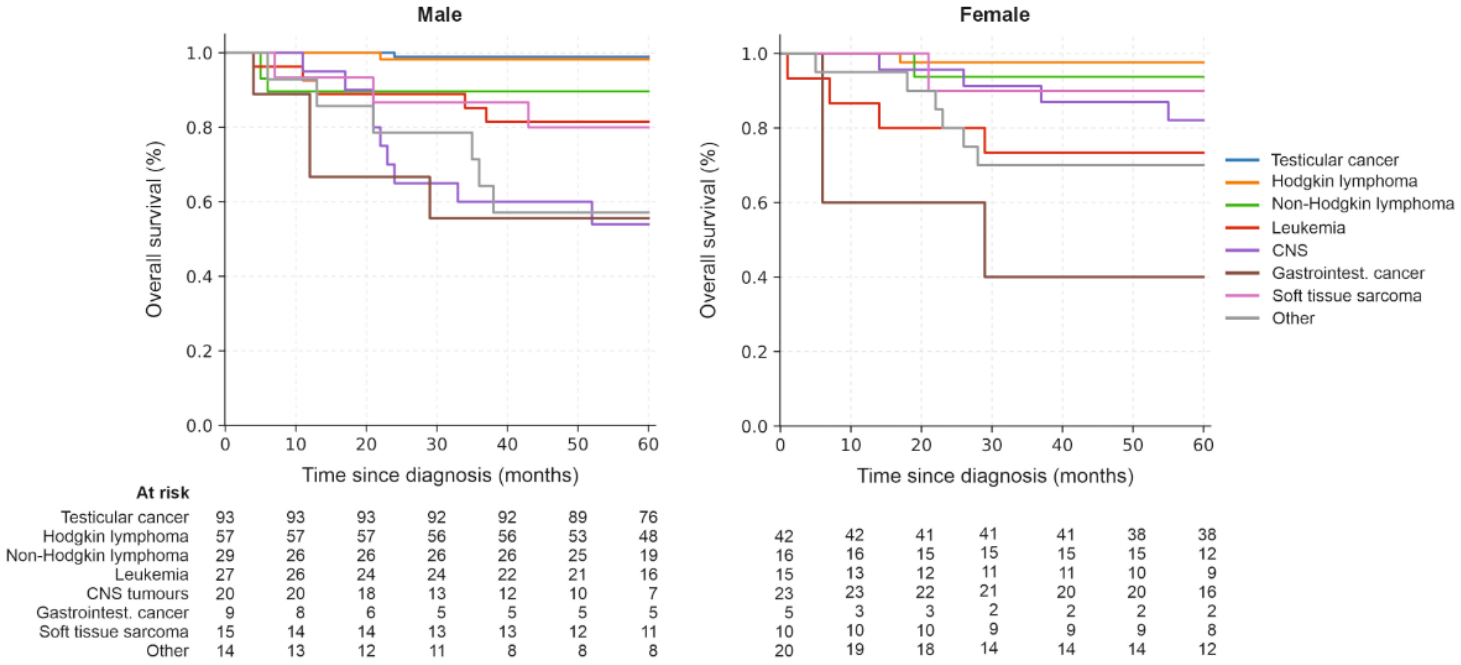
Median age at diagnosis was lowest for Hodgkin lymphoma (24 years) and bone and soft tissue sarcoma (24 years), and highest for gastrointestinal cancers (30 years) (table 2). Disease stage, defined as localised or advanced/metastatic, also differed between diagnoses, with most testicular cancers being localised while half of gastrointestinal cancers were metastatic (figure 2).

Figure 2: Local vs. advanced disease for relevant diagnosis groups with at least 10 patients (n = 276).



Five-year survival for the entire cohort was 84% (n = 283), and decreased with older age. The highest survival was seen for testicular cancer (99% or n = 76) and Hodgkin lymphoma (98% or n = 83), and lowest survival for patients with gastrointestinal cancer (50% or n = 7) (table 2, figure 3). Lower odds of survival were associated with older age (Odds Ratio [OR]: 0.88, 95% confidence interval (CI): 0.83–0.95) and diagnoses other than testicular cancer and Hodgkin lymphoma (e.g. non-Hodgkin lymphoma with OR: 0.08, 95% CI: 0.008–0.75), but not sex (figure 4A). Using the model for the 238 patients whose tumours could be characterised as either localised or advanced/metastatic, cancer type (and advanced/metastatic disease [OR: 0.23, 95% CI: 0.08–0.66]) were the only factors associated with lower survival (figure 4B). Among patients who died (n = 60), 52% (n = 31) had had a palliative care consultation with a median interval of 1.6 years (IQR: 0.8–2.2) from diagnosis to palliative care consultation (table 1).

Figure 3: Kaplan-Meier plots of 5-year survival for males and females.



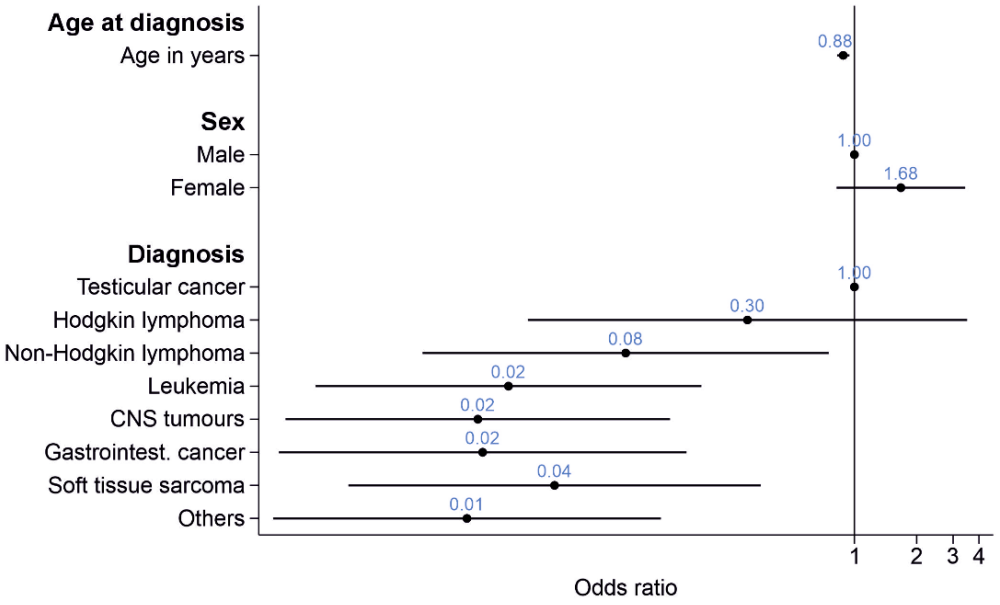
At risk

Testicular cancer	93	93	93	92	92	89	76
Hodgkin lymphoma	57	57	57	56	56	53	48
Non-Hodgkin lymphoma	29	26	26	26	26	25	19
Leukemia	27	26	24	24	22	21	16
CNS tumours	20	20	18	13	12	10	7
Gastrointest. cancer	9	8	6	5	5	5	5
Soft tissue sarcoma	15	14	14	13	13	12	11
Other	14	13	12	11	8	8	8

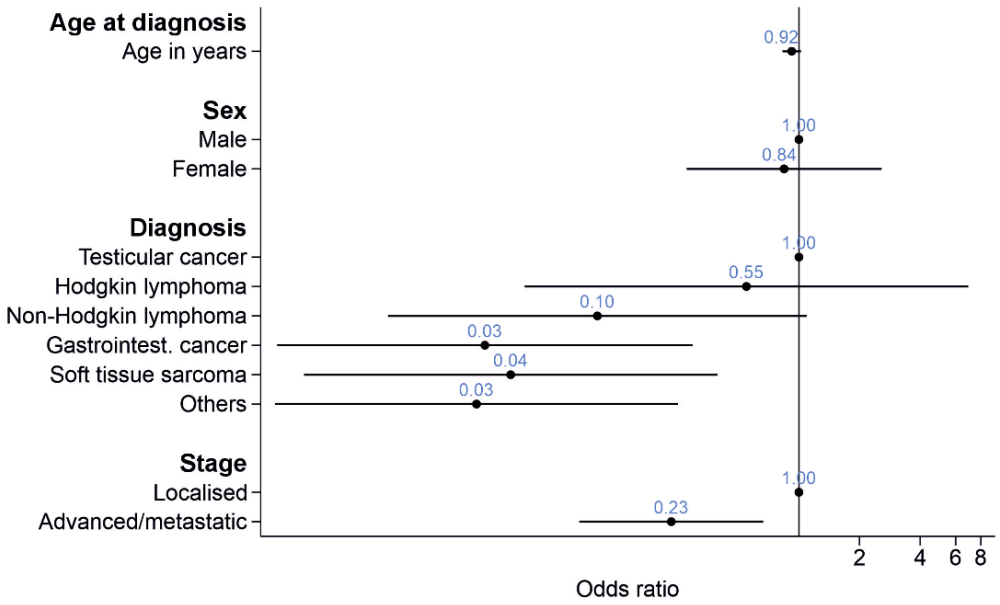
	42	42	41	41	41	38	38
	16	16	15	15	15	15	12
	15	13	12	11	11	10	9
	23	23	22	21	20	20	16
	5	3	3	2	2	2	2
	10	10	10	9	9	9	8
	20	19	18	14	14	14	12

Figure 4: Results of logistic regression with survival at year 5 (Yes/No) among people followed up for at least 5 years and (A) including age at diagnosis, sex and major diagnosis group (n = 336), (B) including age at diagnosis, sex, major diagnosis group, and local vs metastatic disease (n = 238).

A



B



In 16 patients (4%), the cancer diagnosed and treated at University Hospital Bern represented either a second, distinct cancer or a relapse of a previously known childhood cancer. The most common first diagnosis was leukaemia (n = 6) and among 10 of 16, the second cancer was a recurrence. On average, the second cancer was diagnosed 3.4 years after the initial diagnosis. After a median follow-up of 7.7 years, 6 of these patients were deceased (37%), which is a higher proportion than among those with only one recorded tumour (14% or n = 60).

Discussion

Cancer characteristics and survival outcomes

This study presents the first Swiss data analysing the adolescent and young adult population treated at one of six tertiary oncological referral centres. This comprehensive review of all patients treated over a 6-year period reflects an area of uptake of around one million people, representing around an eighth of the total contemporary Swiss population. While most published studies of adolescent and young adult patients with cancer use registry data, this study shows the burden of disease and patterns of care from a clinical perspective. The few other existing clinical studies include either just one cancer type or present limited data, making comparison with our findings difficult. Compared to registry series, there were some differences, particularly in distribution of cancer type and survival outcomes.

Just over half of the cancers in this series were Hodgkin lymphoma and testicular cancer. By comparison, GLOBOCAN data from 2022 showed the highest prevalence of breast (19%) and thyroid cancer (18%) [12], while SEER data between 1975 and 1998 among adolescents and young adults aged 20–29 years was more similar, with Hodgkin lymphoma (12%), melanoma (12%), testicular (12%) and non-Hodgkin lymphoma (6%) [5]. Among adolescents and young adults 30–39 years old, breast cancer was most common (20%) followed by malignant melanoma (11%). An Australian study based on registry data from 2003 to 2015 also reported that 15% of all cancers in adolescents and young adults were melanomas, but Australia has the highest rate of melanoma in the world with an age-standardised rate (ASR) per 100,000 of 35.1 [23], relating to its geography and weather [24]. However, Switzerland also has a relatively high ASR of 20.3 [23] for melanomas, which is why we did not expect to see so few cases in our sample. A possible explanation is that adolescents and young adults diagnosed with melanoma are only referred to oncology centres if they have metastatic disease, with dermatologists treating localised melanoma. The relatively low rate of breast cancer in our series is not explained by the overall breast cancer incidence in Switzerland, which is similar to other high-income countries [25] but may be explained by the overall small numbers, and/or by referral patterns to private centres, although international guidelines recommend all adolescent and young adult cancers be treated in a designated adolescent and young adult centre.

Five-year survival was highest for testicular cancer (99%) and Hodgkin lymphoma (98%), and lowest for gastrointestinal cancers (50%) and central nervous system tumours (64%), which mirror the SEER adolescent and young adult data for 2000–2014 showing a 5-year survival rate for Hodgkin lymphoma of 94% and EUROCARE-6 data for 1999–2007 showing a rate of 95% [3, 26]. EUROCARE-6 adolescent and young adult data reported 5-year survival rates of 97% for testicular cancer and 62% for central nervous system tumours [3].

Clinical trial participation

With regards to patterns of care, this study documented a clinical trial participation rate of 29%, which is at the upper limit of the 12% to 29% range reported in a recent review of 10 identified studies published between 2010 and 2018 of adolescent and young adult clinical trial participation [27]. To place this in context, trial participation in paediatric patients with cancer in the US is reported at 19% [28]; by contrast, for adult cancer patients, clinical trial participation rates range between 7.7% and 8.1% in different countries [29–31], with a similar 7.8% clinical trial participation rate for adult patients receiving anti-cancer immunotherapies at our centre [32].

In our series, participation differed by diagnosis; more than half of patients with leukaemia participated in a trial, while for adolescents and young adults with sarcoma and central nervous system tumours this was, respectively, only 8% and 19%. This difference is in line with existing evidence [27, 33] and most likely reflects complex factors that govern trial availability, including funding, clinical interest and drug availability. Given that this is a retrospective analysis based on medical chart review, data relating to the number of patients who were offered a trial but declined to participate, or were ineligible, is not available. Studies examining clinical trial participation by adolescent and young adult patients show that reasons for accepting or declining trial enrolment are multifactorial and related to patient, provider and structural factors [34]. For instance, the most commonly reported reasons for non-participation include concerns about side effects of the treatment and concerns that the treatment has not been sufficiently tested [35].

Supportive care

Fertility is a major issue for adolescents and young adults with cancer. The broad age range may include prepubertal individuals and those who have already fulfilled their fertility desires, but the majority are at a time in their life where options for fertility preservation are highly relevant. In this series, among those who had a fertility consultation, 75% of females and 92% of males underwent fertility preservation. This is substantially more than what was found in a study from another Swiss centre collecting data among patients treated for leukaemia between 2002 and 2012, in whom 1 of 44 (2.3%) female patients aged 17–45 years underwent fertility preservation and 33 of 101 (33%) male patients aged 14–60 years underwent fertility preservation [36]. The lower rate of fertility preservation among females than males in our and previous studies may be because preservation is more complicated in females. It is unfortunate that most medical records do not require documentation of reasons fertility consultations were not undertaken, and we therefore do not know why some patients refused fertility preservation. One reason might be fear of treatment delay; however, unlike previous decades, modern techniques not only mean higher rates of successful sperm or oocyte collection and subsequent usage for both men and women, but more rapid processes, meaning that these interventions usually no longer impact the timing of start of treatment [37]. One further important factor is cost, as even for cancer patients, fertility preservation is not universally covered by health insurance in Switzerland [38, 39].

A referral to palliative care occurred in 8% of all patients, which is in line with recent data from a US tertiary centre including 4674 adolescents and young adults, where also 8% were referred to palliative care, mostly during inpatient treatment and more likely in specific cancer types with high symptom burden and/or poor survival [40]. Unfortunately, due to low sample size, it was not possible to study differences in palliative care by diagnosis in our patient population. When considering only the patients who died in our cohort, 52% had had palliative care, which is lower than the 90% palliative care rate among patients who died according to a population-based analysis of over 5000 adolescent and young adult patients in Ontario, Canada [41].

Strengths and limitations

Strengths of our study include the broad inclusion of all adolescent and young adult patients treated over a contemporary period at a large Swiss university hospital, compared to most studies in the literature which are based on registry data. This allows broader examination of patterns of care, as well as the ability to probe incomplete or unusual data through further examination of medical records. Study limitations include the cantonal nature of the Swiss healthcare system, which may affect the generalisability of the data. Complex adolescent and young adult cancer patients are typically referred to specialised cancer centres like University Hospital Bern, while the majority of adolescent and young adult patients are still treated in peripheral oncology units. Additionally, as with all retrospective studies, the use of electronic medical records introduces the potential for information bias, as clinical data was recorded for patient care purposes rather than for research, representing an inherent limitation of the study design. Furthermore, the sample size poses limitations for comparing characteristics between patients with less common tumours. While data on survival was carefully collected, there is potentially less rigorous data than a registry-based study. Finally, our sample might underrepresent those aged 15–17 years, as these patients might have been referred to the separate paediatric oncology centre.

Conclusion

This study highlights the importance of recognising adolescents and young adults with cancer as a distinct patient group with unique physical and psychosocial care needs. The age range covers older patients with paediatric-type malignancies, younger patients with typically adult-age cancers, as well as the group of cancers that predominate in the adolescent and young adult age range. In conclusion, our analysis shows that at our specialised centre, survival was high and in line with other series. Fertility preservation rates were higher than in other studies, highlighting a possible improvement, but palliative care consultations were still scarce. Further research and reporting for this special group of patients are needed to ensure all receive the highest quality of comprehensive cancer care.

Data sharing statement

Patient-level data from this study cannot be shared because they are subject to Swiss data protection rules and ethical constraints.

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Potential competing interests

All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. M. D. Berger reports Consulting fees to the institution and from Merck and participation on an Advisory Board for Merck. B. C. Özdemir reports participation on Advisory Boards for Sanofi, Novartis, BMS, MSD, Merck, Astellas, Immunocore, Iovance and Johnson and Johnson (all paid to institution). No other potential conflict of interest related to the content of this manuscript was disclosed.

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Supplementary table 1: Characteristics of patients treated for cancer at Inselspital Bern between January 2015 and December 2021.

	Male N=335	**Female** N=162	**Total** N=497
	n (%)	n (%)	n (%)
Age at diagnosis			
15-19 y	46 (14)	32 (16)	78 (16)
20-29 y	183 (55)	79 (49)	262 (53)
30-39 y	106 (32)	51 (31)	157 (31)
Diagnosis			
Testicular cancer	125 (37)	0	125 (25)
HL	62 (18)	46 (28)	108 (22)
NHL	41 (12)	23 (14)	64 (13)
Leukemia	34 (10)	16 (10)	50 (10)
CNS tumours	21 (6)	25 (15)	46 (9)
Gastro-intestinal cancer	12 (4)	8 (5)	20 (4)
Bone and soft tissue sarcoma	17 (5)	13 (8)	30 (6)
Breast and female genital cancer	0	14 (9)	14 (3)
Melanoma and other skin cancer	9 (3)	2 (1)	11 (2)
ENT cancer	4 (1)	4 (2)	8 (2)
Bladder cancer	2 (1)	4 (3)	6 (1)
Other*	8 (2)	7 (4)	15 (3)
First treatment			
Inselspital Bern	264 (79)	131 (81)	395 (79)
Other Swiss hospital	55 (16)	23 (14)	78 (16)
Hospital in another country	10 (3)	3 (2)	13 (3)
Unknown	6 (2)	5 (3)	11 (2)

*Other diagnoses displayed in detail in supplementary table 2. Abbreviations: . Abbreviations: HL; Hodgkin lymphoma, NHL; non-Hodgkin lymphoma, CNS; central nervous system, ENT; ear nose throat, BMI: body mass index

Supplementary table 2: Exact diagnosis among patients with gastro-intestinal, breast and other female genital tract, and other cancers

	Male	female
Gastro-intestinal	**9**	**5**
Colon carcinoma	3	2
Gastroesophageal cancer	2	1
Hepatocellular and cholangiocarcinoma	1	0
Pancreatic carcinoma	1	0
Rectal carcinoma	2	2
Breast and female genital		**5**
Breast cancer ER and PR positive HER2 negative		1
Breast cancer triple negative		4
Other	**6**	**7**
Carcinoid		
Neuroendocrine tumor of the cervix		1
Atypical carcinoid of the lung with pulmonary, hepatic, and osseous metastases	1	
Blood vessel tumor (rare vascular malignancies)		
Metastatic malignant endothelial neoplasia	1	
Hepatic und pulmonary hemangioendothelioma		1
Metastatic angiosarcoma of the right atrium	1	
Langerhans cell histiocytosis		
Multisystem Langerhans cell histiocytosis	1	
Monosystem, unifocal Langerhans cell histiocytosis		1
Langerhans cell histiocytosis, eosinophilic granuloma	1	
Multifocal Langerhans cell histiocytosis		1
Other		
Adenocarcinoma of the lung with lymphatic and osseous metastases		1
Myeloproliferative hypereosinophilic syndrome		1
Neuroendocrine tumor of the thymus with lymphatic, pulmonary, and hepatic metastases		1
Non-Langerhans cell histiocytosis	1	