Survival Trends for non-Hodgkin lymphoma patients in Switzerland

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riencing a benign course of disease whereas others have a more aggressive phenotype.
In the present descriptive study, epidemiological information from tumour registries of seventeen Swiss cantons have been collapsed to examine the survival patterns of adult patients diagnosed with malignant primary non-Hodgkin lymphoma during the last 30 years. In the international prognostic index (IPI) for aggressive lymphoma and the follicular lymphoma international prognostic index (FLIPI) for indolent lymphoma, age and disease specific characteristics but not gender are recognized as a prognostic factor. As in epidemiologic studies from other countries, we found clear survival differences between patient age-groups and NHL cell types, and minor differences between sexes in this population-based study.

Introduction

Non-Hodgkin lymphoma (NHL) are among the six most common cancer types in Switzerland with a stable standardized incidence rate for NHL at about 17 yearly diagnoses in males or 12 in females per 100'000 for the last 20 years. Standardized mortality rates decreased from 7 deaths due to NHL to 5 per 100'000 in males and from 5 to 3 per 100'000 in females in the same time period [1].
WHO classification defines B- and T-cell lymphoid malignancies and two major prognostic categories, the indolent and aggressive lymphoma. The aggressive lymphomas are sub-grouped into diffuse large B-cell lymphoma (DLBCL), follicular lymphoma grade 3, Burkitt lymphoma, mantle cell lymphoma (MCL) and T-cell lymphoma. Follicular lymphoma grade 1-2, marginal zone B-cell, lymphoplasmacytic and small B lymphocytic lymphoma are classified as indolent (Table 2). Whereas the aggressive lymphomas have a high curative potential, the indolent lymphomas are slow-growing diseases exhibiting a heterogeneous clinical course, with a subset of patients expe-

Methods

This study is based on the National Core Dataset (NCD) managed by the National Institute for Cancer Epidemiology and Registration (NICER) for the purpose of national cancer monitoring in Switzerland. Twenty of 26 Swiss cantons have transmitted population-based cancer data to the NCD up to diagnosis date 31.12.2011. Cancer cases from 17 cantons were collapsed for this report: Appenzell Ausserrhoden (AR) and Appenzell Innerrhoden (AI), Basel-Landschaft (BL) and Basel-Stadt (BS), Fribourg (FR), Geneva (GE), Glarus (GL), Graubünden (GR), Lucerne (LU), Nidwalden (NW), Obwalden (OW), St. Gallen (SG), Ticino (TI), Uri (UR), Valais (VS), Zug (ZG) and Zurich (ZH). The cantons of Neuchâtel, Jura and Vaud could not be included, because they do not provide information on patient survival to the NCD.
Cancer registries recorded all incident cancer cases diagnosed in their resident population and assessed cases' survival by active and/or passive follow-up until 31.12.2011. We extracted 16'579 malignant primary cancer diagnoses for non-Hodgkin lymphoma (NHL) from 1980 to 2011.

Cantonal Cancer Registry	Year of diagnosis	Number of cases by age and sex							Person-years	% of total person-years
		15-64		65-74		75+		≥ 15		
		Male	Female	Male	Female	Male	Female	Both		
ZH/ZG	1980-2011	1295	971	757	627	822	900	5372	21986	32.2
SG/AR/AI	1980-2011	533	399	276	273	310	385	2176	11449	16.7
GE	1980-2011	574	369	227	211	275	352	2008	10416	15.2
BS/BL	1981-2009	465	356	308	236	302	397	2064	10668	15.6
TI	1996-2011	255	204	168	176	184	244	1231	5491	8.0
VS	1989-2011	251	179	124	114	137	131	936	4590	6.7
GR/GL	1989-2011	161	129	107	97	119	129	742	3051	4.5
FR	2006-2011	77	44	28	34	30	40	253	612	0.9
LU/UR/OW/NW	2010-2011	25	28	16	19	24	21	133	104	0.2
Total		3636	2679	2011	1787	2203	2599	14915	68367	100.0

Table 1. Number of malignant cases of non-Hodgkin lymphoma retrieved from the Swiss national dataset for survival analysis, by Swiss cantons, age and sex. Seventeen cantons are covered by nine cancer registries. The % of total person-years represents the contribution to national estimates.

For the cantons BL and BS the latest available year of diagnosis was 2009. NHL was defined by ICD-10 codes C82-C85 and C96. Morphological types were grouped according to HAEMACARE [2] and grade categories were according to KML (Kompetenznetz Maligne Lymphome) [3].
We excluded 17 primary diagnoses of NHL because they occurred after a primary NHL diagnosis in the same person. Patients with different multiple primary tumours (21%) were included [4]. We excluded all cases diagnosed at death (N=471) or with a death certificate as the only source of information (N=230). Case finding via death certificates was infrequent (1%-7%, depending on cancer registry). Excluded were 771 cases because no active follow-up has been performed. Recent active follow-up was lacking for 1'626 cases (i.e. follow-up before Dec 2011). The vital status of these cases was set lost to follow-up using the date of last contact. Further 175 cases were excluded because age at diagnosis was below 15 years, the eligibility limit in this study. A total of 14'915 cases (86%) remained for analysis, with 60% of observations uncensored (i.e. patients who have died).
Because we did not assume survival up to 31.12.2011 in the absence of reported death (i.e. based on passive follow-up alone), our survival estimates will be conservative. The assumption of survival in the absence of reported death could overestimate survival because two large registries did not utilize death certificates for several diagnosis years: ZH (1980-1996) and BS/BL (1981-2001, 2008-9).
Completeness of case ascertainment for NHL was estimated with the mortality-incidence ratio (MIR). A ratio above unity is suggestive of under-registration of diagnoses. MIRs were determined for consecutive 5-year intervals from 1987 to 2011 for each cancer registry and provided no evidence for systematic under-registration [1]. MIRs ranged between 0.25 and 0.35.
Observed survival (OS) and relative survival (RS) were derived for consecutive time intervals of increasing length after diagnosis during which the hazards were assumed to remain constant. Temporal divisions were 0.05, 0.1, 0.2, 0.4, 0.6, 1, 2, 3, 4, 5, and 6 years. RS was calculated as the ratio of the observed survival of cancer cases and the expected survival of persons in the general population matching in age, sex, calendar year of death and cantonal pool [5]. Expected cancer survival was estimated using the Ederer II method applied to all-cause mortality tables for the cantons combined [6]. All-cause death probabilities, transformed from age-, sex- and calendar year-specific death rates, were interpolated and smoothed using the Elandt-Johnson formula [7]. RS ratios were estimated using the strs command (version 1.3.7) [8] written for the Stata Statistical Software [9]. Period survival analysis [10], which defines cases by follow-up dates, was applied. RS estimates were age-standardized using weights specific for NHL from the International Cancer Survival Standards (ICSS) [11]. Ninety-five percent confidence intervals (95% CI) were estimated using the delta method to a transformation of the cumulative hazard. For age-standardized RS, 95% CI were estimated as described in [11].
To test for linear time trends of RS, the annual percentage change and its 95% CI was estimated with the Joinpoint Regression Program v4.0.4 [12].

Results

This report combines more than 68'000 person-years of survival experience for patients diagnosed with primary malignant NHL (Tab. 1). The data pool contains increasing numbers of cancer registries over time. Until 1995, only the cantons AR, AI, BL, BS, GE, SG, and ZH contributed to the pool, whereas canton TI joined in 1996, canton FR in 2006, canton LU in 2010, and cantons OW, NW, UR and ZG in 2011. Cantons without cancer registration before 1996 contributed only 20% of the total cases.
The case pool comprised of 7'850 male and 7'065 female patients (total 14'915). Age at diagnosis in our study ranged from the pre-defined 15 to 102 years. The median age at diagnosis was 66 years in men (interquartile range IQR 53-76) and 70 years in women (IQR 58-79). There was no change in median age at diagnoses over time. Almost half of all patients were diagnosed before their 65th birthday and 30% were older than 75. Information regarding detection of the cancer was available from the cantons GE, VS and FR and revealed that symptoms were responsible for detection in 75% of the cases.
Tab. 2 shows that by far the most common primary malignancy was diffuse large B-cell lymphoma, 30% in males and in females, or 2'339 male cases and 2'140 female cases, respectively. Diffuse large B-cell lymphoma form part of the dominant group of mature B-cell neoplasms, 6'059 cases or 78% in males and 5'551 cases or 79% in females. The group of mature T-cell and NK-cell neoplasms totalled 576 cases or 7% in males and 375 cases or 5% in females. Unspecified lymphoid neoplasms amounted to 13% in both sexes, 980 male and 935 female cases. The majority of cases (53% in males, 49% in females) were high-grade (aggressive) neoplasms, 31% were low-grade (indolent) in males, and 35% in females.
The survival experience at one and five years after diagnosis for males and females diagnosed with NHL is shown in Tab. 3 and in Fig. 1. Temporal survival trends were analysed using four consecutive time periods of five years duration, starting in 1992 and ending in 2011. For all grades of NHL combined, the age-standardized relative survival (RS) in men improved over time from 69.4 to 84.3% and 46.7 to 68.4% for one and five years after diagnosis, respectively. The statistically significant annual percentage changes (APC) were +1.1% and +2.3%,

HAEMACARE Group[1]	ICD-O-3 morphological type	ICD-O-3 code	ICD-10 code	Grade[2]	No. of male cases	No. of female cases
Mature B-cell neoplasms	Malignant lymphoma, large B-cell, diffuse, NOS	9680	C83.3	aggressive	2339	2140
	Mantle cell lymphoma	9673	C83.8	aggressive	538	254
	Malignant lymphoma, large B-cell, diffuse, immunoblastic, NOS	9684	C83.4	aggressive	285	243
	Malignant lymphoma, mixed small and large cell, diffuse	9675	C83.2	aggressive	275	299
	Burkitt's lymphoma, NOS	9687	C83.7	aggressive	186	80
	Follicular lymphoma, grade 3	9698	C82.2	aggressive	154	177
	Malignant lymphoma, lymphoplasmacytic	9671	C83.8	indolent	517	445
	Malignant lymphoma, small B lymphocytic, NOS	9670	C83.0	indolent	515	409
	Follicular lymphoma, NOS	9690	C82.9	indolent	511	619
	Marginal zone B-cell lymphoma, NOS	9699	C82.7	indolent	425	517
	Follicular lymphoma, grade 2	9691	C82.1	indolent	198	212
	Follicular lymphoma, grade 1	9695	C82.0	indolent	116	156
Mature T-cell and NK-cell neoplasms	Mature T-cell lymphoma, NOS	9702	C84.4	aggressive	209	151
	Anaplastic large cell lymphoma, T cell and Null cell type	9714	C84.5	aggressive	118	68
	Angioimmunoblastic T-cell lymphoma	9705	C84.4	aggressive	72	56
	Mycosis fungoides	9700	C84.0	indolent	177	100
Unknown lymphoid neoplasms	Malignant lymphoma, non-Hodgkin's, NOS	9591	C85.9	unknown	666	621
	Malignant lymphoma, NOS	9590	C85.9	unknown	314	314
				Not listed[3]	235	204
				All cases	7850	7065

1: Manual for Coding and Reporting of Haematological Malignancies (HAEMACARE).

2: Kompetenznetz Maligne Lymphome e.V. (KML)

3: Codes with <120 cases for males and females combined

Table 2. Number of cases for malignant non-Hodgkin lymphoma by HAEMACARE groupings, morphological type, grade and sex, diagnosed during 1980-2011 in seventeen Swiss cantons

respectively. The relative survival (RS) in women was generally higher compared to men, except for age 75+. The age-standardized RS improved over time from 73.2 to 84.8% and 49.7 to 74.1% for one and five years after diagnosis, respectively.

Grade-specific survival analysis demonstrated better survival for indolent types of malignancies as compared with aggressive malignancies. Positive trends for one-year as well as five-year relative survival are consistently more pronounced in aggressive types of NHL as compared to indolent NHL. This holds true for both sexes and all age-groups. It is related to the generally smaller RS values in aggressive NHL as compared to indolent NHL, where the one-year RS in patients below 65 has reached a level indistinguishable from persons of the general population (i.e. RS of 100%).

Patients above 75 years of age at diagnosis seemed to have gained slightly less in absolute terms than younger patients (age 15-64) if five-year RS in aggressive NHL is concerned. In males, the gap in RS has widened over time from 25% in the first time period (the difference in RS between 48.8% for age <64 and 23.6% for age >75) to 33% in the last time period (the difference between 71.9% for age <64 and 38.8% for age >75), and in females from 31 to 41%, respectively (Tab. 3 and Fig. 1). If five-year RS in indolent NHL is concerned, the age gap in RS over time was less affected, from 26 to 22% in males and 29 to 32% in females.

Discussion

For the first time data on NHL from seventeen Swiss cantons could be pooled for outcome analysis. The data spans a maximum time period of 30 years. There are limitations to our study. First, NHL is a heterogeneous disease with different histologic subgroups, treatment and outcomes (Table 2, 3). Diffuse large B-cell lymphoma (DLBCL) the most frequent subgroup of aggressive lymphoma is treated with immunochemotherapy as R-CHOP-like regimens in all age-groups. Roughly sixty percent of the patients are cured with this regimen [13]. Whereas in mantle cell lymphoma (MCL), accounting for an estimated 3–6% of all NHL cases, immunochemotherapy is followed by high dose chemotherapy and autologous stem cell transplantation at least in transplant eligible subjects. MCL has a median overall survival of only 4–5 years. In indolent lymphomas the range of treatment strategies is even larger: from watch and wait, immunotherapy or radiotherapy alone to immunochemotherapy. Recurrent disease in MCL and indolent lymphoma

Years since Diagnosis	Age in years at Diagnosis	Relative survival [%] in Male						Relative survival [%] in Female					
		Calendar period of death or censoring				APC [2]	[95% CI]	Calendar period of death or censoring				APC [2]	[95% CI]
		1992-1996	1997-2001	2002-2006	2007-2011			1992-1996	1997-2001	2002-2006	2007-2011		
All NHL													
1	15-64	71.2	81.9	89.3	91.4	1.2	[-0.2, 2.5]	82.1	85.2	91.6	94.8	0.8	[0.4, 1.2]
	65-74	75.4	80.9	76.3	86.7	0.7	[-1.0, 2.4]	76.5	77.7	84.9	87.2	0.8	[0.1, 1.5]
	75+	56.0	55.7	67.9	71.2	1.6	[-0.2, 3.3]	53.5	57.7	62.6	66.1	1.2	[0.9, 1.5]
	stand.[3]	69.4	74.1	79.1	84.3	1.1	[1.1, 1.1]	73.2	75.6	81.8	84.8	0.9	[0.4, 1.3]
5	15-64	54.1	62.3	74.7	80.6	2.2	[0.9, 3.4]	60.7	68.4	80.2	88.5	2.1	[1.5, 2.7]
	65-74	51.2	52.4	52.0	68.7	1.8	[-1.6, 5.4]	51.7	60.7	62.2	77.0	2.2	[0.3, 4.1]
	75+	30.6	30.5	39.1	50.1	3.2	[0.5, 6.0]	30.2	36.7	41.8	48.1	2.5	[1.9, 3.1]
	stand.[3]	46.7	50.0	57.1	68.4	2.3	[1.1, 3.6]	49.7	57.2	64.4	74.1	2.2	[2.0, 2.5]
Aggressive NHL													
1	15-64	66.8	72.8	84.6	85.9	1.4	[-0.3, 3.0]	73.2	77.1	86.6	90.8	1.2	[0.5, 1.9]
	65-74	65.1	75.1	66.2	79.6	0.8	[-2.1, 3.8]	65.9	68.7	78.7	79.3	1.1	[-0.3, 2.5]
	75+	47.1	45.5	56.8	61.6	1.8	[-0.2, 3.8]	44.2	46.7	52.7	56.3	1.4	[0.8, 2.0]
	stand.[3]	61.9	65.1	70.6	77.0	1.3	[0.9, 1.7]	63.7	66.1	75.2	78.2	1.2	[0.3, 2.2]
5	15-64	48.8	53.7	65.2	71.9	2.3	[1.3, 3.2]	52.1	56.6	70.3	81.6	2.7	[1.7, 3.7]
	65-74	40.3	45.6	37.6	58.9	2.1	[-3.8, 8.5]	41.2	50.4	50.4	68.5	2.8	[0.0, 5.7]
	75+	23.6	23.8	25.7	38.8	3.3	[-3.8, 8.5]	21.1	27.2	36.3	40.4	3.5	[1.2, 5.9]
	stand.[3]	38.7	42.8	44.3	58.6	2.5	[-0.3, 5.3]	40.5	46.3	55.4	66.8	2.9	[2.3, 3.5]
Indolent NHL													
1	15-64	92.5	99.1	98.0	100.5	0.2	[-0.3, 0.7]	98.2	96.0	97.1	99.9	0.2	[-0.3, 0.6]
	65-74	91.1	91.4	92.3	96.6	0.4	[-0.1, 0.9]	89.5	89.3	94.6	98.1	0.6	[0.2, 1.1]
	75+	73.8	81.8	89.0	90.7	1.0	[-0.2, 2.1]	81.8	83.4	87.0	87.9	0.4	[0.1, 0.8]
	stand.[3]	86.2	92.2	93.7	96.7	0.5	[0.1, 1.0]	91.3	90.4	93.4	96.0	0.3	[-0.1, 0.8]
5	15-64	71.6	79.8	89.6	94.5	1.4	[0.5, 2.3]	80.0	81.4	88.5	95.9	1.2	[0.5, 1.8]
	65-74	65.3	64.0	74.6	78.5	1.2	[-0.2, 2.7]	71.7	75.5	78.9	89.1	1.3	[0.3, 2.4]
	75+	45.3	44.3	70.9	72.9	3.0	[-1.8, 8.0]	51.3	57.1	57.4	64.2	1.2	[0.1, 2.3]
	stand.[3]	61.4	64.0	79.7	83.1	1.8	[-0.2, 3.9]	69.0	72.5	76.8	85.0	1.2	[0.6, 1.9]

[1] Relative survival analysed with period approach
[2] Annual percentage change. CI: confidence interval
[3] Age standardized using ICSS weights
Underlined RS is significantly higher in females compared with males

Table 3. Trends in one-year and five-year relative survival for non-Hodgkin lymphoma (NHL), expressed as the annual percentage change (APC), by sex and grade. Cases were pooled from seventeen Swiss cantons for successive five-year calendar periods of follow-up. Trends are statistically significant if the 95% CI excludes zero.

is frequent. Second, missing clinical data as stage of disease and treatment regimen are further important limitations. Thus, evidence of improved outcome of NHL in this study, is to be interpreted with caution as the data are based only on the two major histologic groups of aggressive and indolent lymphomas.

In Switzerland as in other western countries, we observed a trend of improved relative survival of NHL over the time periods as well as over the age-groups (Table 3 and Fig 1). The results of EUROCARE-5, an European wide population-based study, demonstrated the largest increase in 5-year relative survival for DLBCL from 1997–99 to 2006–08 with 42.0% [95% CI 40.7–43.4] to 55.4% [54.6–56.2], p<0.0001) and follicular lymphoma 58.9% [57.3–60.6] to 74.3% [72.9–75.5], p<0.0001) [14].

The relative survival (RS) at 5-years of the Swiss population with aggressive lymphoma, including 56% DLBCL in males and 62% DLBCL in females, improved with annual percentage change (APC) of 2.5% for males (95% CI -0.3 – 5.3) and 2.9% for females (95% CI 2.3 – 3.5). This corresponds to a change of 5-year relative survival from 39% to 59% in males and 41% to 67% in females from the first to the last analysed period. The observed survival gains of 16% (males) and 21% (females) between the 2nd and 4th time period in Switzerland are thus slightly larger as compared with the gain of 13% for DLBCL in EUROCARE-5, but very similar to a population-based study in the Netherland for DLBCL [14, 15].

Five-year relative survival of aggressive lymphoma for adults <65 years changed from 48.8% (males), 52.1% (females) in the time period 1992 – 1996 to 53.7% (males), 56.6% (females) in the period 1997 – 2001. This improvement is most likely related to the introduction of intensive chemotherapy regimens combined with autologous stem cell transplantation in 1996 with improved supportive care [16]. The marked improvement of 5-year relative survival after 2002 of transplant eligible patients (<65 years) to 72% (males) and 82% (females) in the period 2007 – 2011 is related to the approval of the very effective anti-CD20 monoclonal antibody and its addition to the standard chemotherapy regimen of CHOP in DLBCL in 2002.

Unlike in other cancer types the outcome in older adults, 65 – 74 years of age, with aggressive lymphoma improved as well. This may be due to the fact that this age group benefits of R-CHOP for DLBCL with an increased 2-year OS of 20% – 30% as demonstrated in a large retrospective population-based study of the province of British Co-

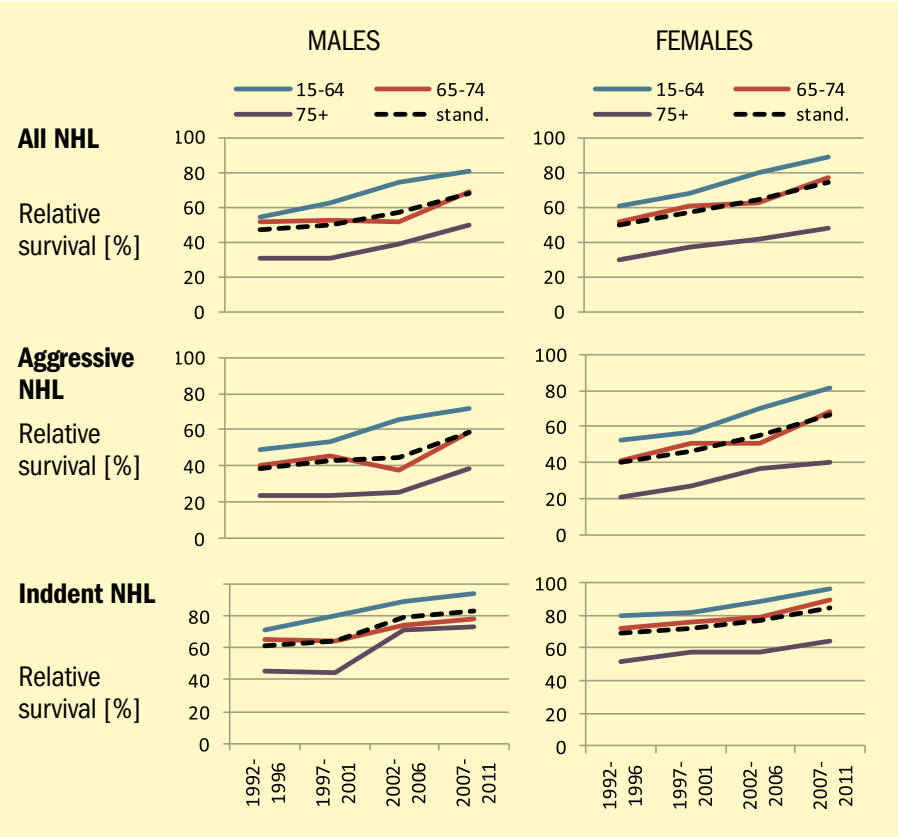

Fig. 1. Trends in five-year relative survival for non-Hodgkin lymphoma (NHL), by sex, age and grade.

lumbia, Canada [18]. Interestingly 5-year relative survival of older males and females in our study differ by about 10% with 58.9% and 68.5% during the last time period, while the 5-year relative survival for age 75+ differs only by about 2% with 38.8% and 40.4%, respectively. The observed survival advantage for females, more pronounced in DLBCL than follicular type lymphoma, and the loss of this advantage at age 75+, was also reported in a recent study from Germany [17]. The difference of survival might be explained by the age and sex dependent clearance of rituximab. Females 65 – 75 years of age have a much more favourable pharmacokinetic of the anti-CD20 monoclonal antibody than males [19].

The outcome of patients older than 75 years, particularly those very old patients (>80 years), depends to a much lesser extent on the disease than on co-morbidities. A prospective study in these frail patients, combining anti-CD20 monoclonal antibody with a dose-reduced CHOP regimen (R-mini-CHOP), showed promising clinical response and 2 year OS of 59% [20]. But the majority of the patients are not treated with standard regimen but without anthracycline-based treatment resulting in a poorer outcome [21, 22].

Follicular lymphoma is the most important subgroup representing 34% of indolent lymphomas in males and 40% in females. Other subgroups are not further mentioned as their numbers are too small and treatment regimens are similar to follicular lymphoma therapy. The temporal gain of 15% in standardised 5-year relative survival of follicular lymphoma in EUROCARE-5 [14] was similar to the 16% (average of male and female gains between 2nd and 4th time period) gain for indolent lymphoma in our study. The RS in Switzerland was about 10% higher, probably because the EUROCARE-5 study did not separate between aggressive and indolent forms of follicular lymphoma. Although anti-CD20 monoclonal antibodies were approved in Switzerland for the treatment of indolent lymphoma already in 1997, the relative survival improved to a somewhat lower extent then in the setting of the aggressive lymphomas. APC is expected to be smaller if survival is generally high but it may also be attributable to the fact that patients with indolent lymphoma have a much longer course of disease and treatment. 5-year relative survival improved accordingly in males and females with APC of 1.8% and 1.2% (95% CI -0.2 – 3.9 and 0.6 – 1.9), respectively (Table 3, Fig. 1).

The study does not separate B- from T-cell lymphomas for the analysis of relative survival, as T-cell lymphomas represent only about 8 – 10% of all lymphomas. With the exception of mycosis fungoides, T-cell lymphomas have an aggressive course of disease. Although in this study not mentioned their outcome is still dismal without improvement over the time periods.

Overall survival of NHL in Switzerland has increased for all subtypes and age groups. Major improvements are seen for aggressive lymphoma particularly the younger, transplant eligible patients <65 years.

References*

1. For trends of cancer incidence and mortality see NICER website at http://nicer.org/
2. HAEMACARE-Cancer Registry Based project on Haematologic Malignancies. Background, rationale and aims. http://www.haemacare.eu/project. Accessed Nov, 2014.
3. Kompetenznetz Maligne Lymphome e.V. (KML). Universitätsklinikum Köln, D-50924 Köln. http://www.lymphome.de/InfoLymphome/NonHodgkinLymphome/Einteilung. Accessed Nov, 2014.

4. Rosso S, De Angelis R, Ciccolallo L, Carrani E, Soerjomataram I, Grande E, Zigon G, Brenner H and the EUROCARE Working Group. Multiple tumours in survival estimates. Eur J Cancer, 2009. 45(6): 1080-1094.
5. Ederer F, Axtell LM and Cutler SJ. The relative survival rate: a statistical methodology. Natl Cancer Inst Monogr 6: 101-121, 1961.
6. Ederer F and Heise H. Instructions to IBM 650 Programmers in Processing Survival Computations. Methodological note no 10, End Results Evaluation Section. 1959. Bethesda MD, National Cancer Institute.
7. Elandt-Johnson RC and Johnson NL. Survival Models and Data Analysis. New York: John Wiley&Sons 1980.
8. Dickman PW, Coviello E and Hills M. Estimating and modelling relative survival. The Stata Journal (in press).
9. StataCorp LP: Data Analysis and Stata Statistical Software. Release 12: 2011. College Station, TX (USA), StataCorp.
10. Brenner H and Gefeller O. An alternative approach to monitoring cancer patient survival. Cancer, 1996. 78(9): 2004-2010.
11. Corazziari I, Quinn M and Capocaccia R. Standard cancer patient population for age standardising survival ratios. Eur J Cancer, 2004. 40(15): 2307-2316.
12. Joinpoint Regression Program, Version 4.0.4 - May 2013; Statistical Methodology and Applications Branch, Surveillance Research Program, National Cancer Institute.
13. Feugier P, Van Hoof A, Sebban C, Solal-Celigny P, Bouabdallah R, Fermé C, Christian B, Lepage E, Tilly H, Morschhauser F, Gaulard P, Salles G, Bosly A, Gisselbrecht C, Reyes F, and Coiffie B. Long-Term Results of the R-CHOP Study in the Treatment of Elderly Patients With Diffuse Large B-Cell Lymphoma: A Study by the Groupe d'Etude des Lymphomes de l'Adulte. J Clin Oncol 2005. 23: 4117-4126.
14. Sant M, Minicozzi P, Mounier M, Anderson L, Brenner H, Holleczek B, Marcos-Gragera R, Maynadié M, Monnereau A, Osca-Gelis G, Visser O, De Angelis R, the EUROCARE-5 Working Group. Survival for Haematological malignancies in Europe between 1997 and 2008 by region and age: results of EUROCARE-5, a population-based study. Lancet Oncol 2014. 15: 931–42.
15. Issa DE, van de Schans SA, Chamuleau ME, Karim-Kos HE, Wondergem M, Huijgens PC, Coebergh JW, Zweegman S, and Visser O. Trends in incidence, treatment and survival of aggressive B-cell lymphoma, in the Netherlands, 1989-2010. Haematologica 2014.
16. Philip T, Guglielmi C, Hagenbeek A, et al. Autologous bone marrow transplantation as compared with salvage chemotherapy in relapses of chemotherapy-sensitive non-Hodgkin's lymphoma. N Engl J Med. 1995. 333: 1540–5.
17. Pulte D , Jansen L , Gondos A , Emrich K, Holleczek B, Katalinic A, Brenner H; for the GEKID Cancer Survival Working Group Survival of patients with non-Hodgkin lymphoma in Germany in the early 21st century. *Leukemia & Lymphoma*, May 2013. 54(5): 979–985.
18. Klasa K, MacPherson N, O'Reilly S, Spinelli J, Sutherland J, Wilson K, Gascoyne R, and Connors JM. Introduction of combined CHOP Plus Rituximab therapy dramatically improved outcome of diffuse large B-cell lymphoma in British Columbia. J Clin Oncol 2005. 23: 5027-5033.
19. Pfreundschuh M, Müller C, Zeynalova S, Kuhnt E, Wiesen MH, Held G, Rixecker T, Poeschel V, Zwick C, Reiser M, Schmitz N, Murawski N. Suboptimal dosing of rituximab in male and female patients with DLBCL. Blood 2014. 123: 640-646.
20. Peyrade F, Jardin F, Thieblemont C, et al. Attenuated immunochemotherapy regimen (R-miniCHOP) in elderly patients older than 80 years with diffuse large B-cell lymphoma: a multicentre, single-arm, phase 2 trial. Lancet Oncol. 2011. 12: 460–8.
21. Thieblemont C, Grossoeuvre A, Houot R, Broussais-Guillaumont F, Salles G, Traullé C. Non-Hodgkin's Lymphoma in very elderly patients over 80 years. A descriptive analysis of clinical presentation and outcome. Ann Oncol. 2008. 774–9.
22. Diem S, Ess S, Cerny Th, Früh M, Hitz F. Diffuse large B-cell lymphoma in elderly patients: A retrospective analysis. *European Journal of Internal Medicine* 2014. 577–582.

* For additional information on cancer in Switzerland, please see the NICER website at http://nicer.org/

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Erratum to Tab. 3 of «Trends in survival from oesophageal cancer in Switzerland» published in SKB3/2014

«The designated annual percentage change (APC) was calculated erroneously per calendar period, instead of per annum. The correct APC and 95% CI from top row to bottom row are: 1.7 [1.2, 2.3], 2.1 [1.6, 2.6], 3.1 [2.3, 3.9], 5.4 [4.2, 6.7], 3.0 [-0.8, 6.9], 6.0 [2.7, 9.5], 2.2 [1.8, 2.6], and 4.3 [2.2, 6.4]. Neither the description of results in the text nor the discussion is affected.»