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Influence of department volume on cancer survival for gynaecological cancers—A population-based study in Tyrol, Austria

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Abstract

Objective. The objective of this study was to assess the effect of department volume on survival of patients with gynaecological cancer.

Methods. We conducted an observational population-based study in Tyrol, Austria. The analysis includes all patient data on incident gynaecological cancer collected by the Cancer Registry of Tyrol. Data were collected since 1988 on a population-based perspective; publication of incidence data since 1988 in Cancer Incidence in Five Continents gives evidence for good completeness and validity of the database. Patient survival status is assessed in a passive way by probabilistic record linkage between incidence data and official mortality data. We applied a multivariate Cox regression with variables age, sex, stage, year of diagnosis, histological verification of diagnosis, transfer to other hospital and department volume. Department volume was categorised in ≤11/12–23/24–35/≥36 patients per year reflecting one/two/three/more than three patients per month; categories were computed separately for every site we analysed. Departments with up to 11 patients per year were called small departments.

Results. For 4191 breast cancer patients, we found a negative effect for small departments; hazard ratio (HR) 1.39, 95% confidence interval (CI) 1.22, 1.58. For ovarian cancer patients, we also found a negative effect for small departments (HR 1.27, 95% CI 1.05, 1.54). For cervical cancer patients, we found a positive effect for small departments (HR 0.67, 95% CI 0.51, 0.88). No effect was shown for corpus cancer (HR 0.80, 95% CI 0.63, 1.01).

Conclusion. The results indicate that, in our country, rules on minimum department case-load can further improve survival for breast and ovarian cancer patients.

Keywords: Gynaecological cancer; Survival rate; Department volume; Minimum caseload; Cancer epidemiology

Introduction

The question whether for cancer patients department volume has an influence on overall survival and other outcome parameters has been investigated for more than a decade. Answers are of great relevance for health planning and policy in the respective countries. An overview published in 2000 [1] concludes that there is an association between centre size and survival for all solid cancer sites for which therapy is complex. One group of publications concentrates on specific cancer sites and/or specific therapy modalities, while another group analyses this question primarily on a population basis. In addition, some authors discuss interesting methodological questions like publication bias or self-interest bias.

In our country, about 25% of patients with gynaecological cancer are treated in small departments (with less than 11 patients per year), ranging from 16% to 52% of patients depending on specific cancer site. Hence, studying the association between department volume and survival was of special public health interest. We consequently analysed the question on a population basis taking into the study all cancer patients diagnosed in the population of Tyrol, not only patients qualifying, for example, for clinical trials. Also, we analysed all major gynaecological cancer sites. In this way, we tried to avoid both biases mentioned above

Abbreviations: CI, confidence interval; HR, hazard ratio; pat/year, patients per year; DCO, death certificate only.

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by reporting results for all investigated cancer sites, irrespective of the kind of results.

Material and methods

The Cancer Registry of Tyrol was established in 1986. Cancer data for the population of Tyrol have been registered on a population basis since 1988. Also, since 1988, data have been published in Cancer Incidence in Five Continents [2], thus giving evidence of good completeness for the incidence data.

Registration is performed from a standardised questionnaire including sex, age, cancer site and histology, date of diagnosis, stage and basic information on primary treatment. Information on co-morbidity is not collected routinely. There are strict rules for collecting these variables in accordance with international guidelines (see for example [3]). The questionnaire is either completed by a physician, or a Cancer Registry clerk collects data directly from clinical records in the treating hospital. Two independent data bases are built up, one incidence database and one we call search database including all information on possible cancer diagnoses (mainly pathology reports, but also information from radiotherapy units and various other data sources) allowing the registry to check completeness. Cancer cases are attributed to treating departments according to place of initial treatment.

Patient life status is assessed in a passive way. We do a probabilistic record linkage between incidence data and the official mortality data set for Tyrol collected by Statistics Austria [4]. In Austria, there is no general use of unique person identifiers as, for example, in Scandinavian countries. Therefore, the Cancer Registry of Tyrol developed a method for probabilistic record linkage based on probabilistic record linkage theory. Using the components last name, birth surname, first name, date of birth, sex and municipality code or zip code, a probability of identity is computed for every pair of persons (denoted p-val), also taking into account phonetic translations and documentation and typing errors. If p-val is greater than 0.95, we assume without further checks that the components describe the same person; for a p-val smaller than 0.75, we assume, again without further checks, that the components describe different persons. A p-val between 0.75 and 0.95 calls for a decision on a case-by-case basis. In general, this means that further information is needed to describe the persons more precisely.

Closure of this study was end of 2003. For a few cases, we received information on out-migration, but only by chance. We cannot systematically check for out-migrant status due to data privacy constraints. However, aggregated data on out-migrants in the population of Tyrol show that, in the age classes above 50, which are the relevant age classes for cancer survival, the out-migrant rate is less than one percent of the population.

We analysed the main gynaecological cancer sites: breast, ovary, cervix and corpus. From 1988 to 2000, 4366 breast cancer cases, 976 ovarian cancer cases, 819 cervical cancer cases and 923 corpus cancer cases were registered in the Cancer Registry. Of these, 169 breast cancer cases, 64 ovarian cancer cases, 15 cervical cancer cases and 16 corpus cancer cases were excluded from analysis because of death certificate only (DCO) status and six breast cancer cases and one ovarian cancer case because of other reasons, mainly due to loss of follow-up. Thus, the final study included 4191 breast cancer cases, 911 ovarian cancer cases, 804 cervical cancer cases and 907 corpus cancer cases.

Care is provided by gynaecologists, medical oncologists and radiation oncologists for ovarian, cervix and corpus cancer and, in addition, by general surgeons for breast cancer. There is no training available in gynaecologic oncology in Austria. Radiotherapy is offered by one Department of Radiotherapy of Innsbruck Medical University and by a radiotherapy unit within the Department of Gynaecology of Innsbruck Medical University. Transfer to another hospital was defined as transfer during primary treatment.

A multivariate Cox model was applied using the variables age at diagnosis, year of diagnosis, histological confirmation, stage according to UICC, transfer to another hospital and residence. Age was categorised in groups 0≤54/55–64/65–74/≥75 and year of diagnosis in groups 1988–1992/1993–1996/1997–2000. Follow-up time is shorter for more recent periods. From a theoretic point of view, this should not bias the results under the assumption that events are evenly distributed over time for all three period groups. The study area is served by one university hospital treating about half of the patients and nine regional hospitals. Department size was defined as average number of incident patients per year (pat/year) and categorised in groups ≤11/12–23/24–35/≥36 pat/year; department size was computed for every site separately. We defined categories a priori according to the rationale one, two, three or more than three patients per month. Departments with ≥36 pat/year are called large departments and departments with 1–11 pat/year are called small departments. In Cox analysis, reference group is defined by large departments except for ovarian cancer and corpus cancer, for which the largest departments had no more than 24–35 pat/year.

Residence was grouped in the capital city Innsbruck and surroundings (Ibk), the western part of Tyrol (OL), the eastern past of Tyrol (UL) and East Tyrol (LZ), which is a county geographically separate from the main part of the state.

Statistical analysis was done with Stata Version 8.0 [5]. After univariate analysis, we fitted a multivariate Cox model separately for every cancer site by initially entering all variables into the model and then removing variables without significant influence (backward elimination). To check the influence of variables, the likelihood ratio test was applied. After the model was set up, we checked proportional hazard ratio assumption first graphically and then by procedure stphtest of Stata.

Significance was tested at the alpha level of 5%. We present hazard ratios (HR) together with 95% confidence intervals (95% CI).

The population of Tyrol was 612,309 in the year 1988, of which 316,057 were females (51.6%). The female population increased to 342,728 in the year 2000.

Results

Fig. 1 and Table 1 show an overview of all cancer sites investigated. For following cancer sites, we found a significant negative effect for small departments as compared to large departments: breast cancer with HR 1.39 (95% CI 1.22, 1.58) and ovarian cancer with HR 1.27 (95% CI 1.05, 1.54). For cervical cancer, we found a positive effect with HR 0.67 (95% CI 0.51, 0.88). A nonsignificant effect was found for corpus cancer at HR 0.80 (95% CI 0.63, 1.01), although the effect was near significance.

The following section describes results for individual cancer sites in more detail.

Of 4191 breast cancer patients, 1/3 were age 54 or younger and 22% were age 75 or older; see Table 2. Multivariate analysis was adjusted for age, histological confirmation, stage, year of diagnosis and department volume; see Table 1.

Of all cases, 3% had no histological verification (HR 2.68, 95% CI 2.17, 3.30), while 33% were stage I (reference category),

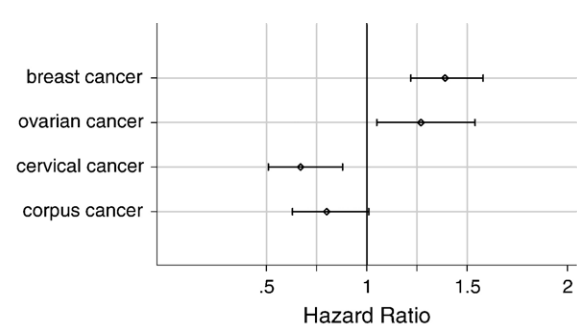

Fig. 1. Hazard ratio for small departments, by cancer site (HR: Hazard ratio adjusted for age, stage, histological confirmation and year of diagnosis. Reference category is large departments ≥36 pat/year for breast cancer and cervical cancer and 24–35 pat/year for ovarian and corpus cancer).