European Journal of Cancer (2013) 49, 585–592

Available at www.sciencedirect.com

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journal homepage: www.ejcancer.info

Minimal excess mortality for long-term colon cancer survivors in the Netherlands 1989–2008

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Available online 8 September 2012

KEYWORDS
Conditional survival
Colon cancer
Long-term survivors

Abstract We determined conditional 5-year relative survival rates for colon cancer patients, according to age, gender and tumour stage for each additional year of survival up to 15 years after diagnosis. All 89,451 patients diagnosed in the Netherlands with colon cancer stage I–III in 1989–2008 aged 15–89 years were selected from the Netherlands Cancer Registry. Conditional 5-year relative survival was computed for every additional year of survival up to 15 years.

There was minimal excess mortality (conditional 5-year relative survival >95%) 1–4 years after diagnosis of stage I patients and 4–7 years after diagnosis of stage II patients, with patients aged 45–74 years reaching this point later compared to both younger and elderly patients. For stage III patients, minimal excess mortality was observed 5 years after diagnosis for those aged 75–89 years, but it remained elevated up to 13 years after diagnosis for those aged 15–44 years. Initial differences in relative survival at diagnosis between age and stage groups largely disappeared with increasing number of years survived.

The prognosis for colon cancer survivors improved with each additional year survived. In the first years after diagnosis conditional survival improved largely for all colon cancer patients, especially for stage III patients. There was minimal excess mortality for colon cancer patients stage I–III at some point within 15 years of diagnosis, being later for more advanced stages. Quantitative insight into conditional survival for cancer patients is useful for caregivers to help plan optimal cancer surveillance and inform patients about their prognosis.

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http://dx.doi.org/10.1016/j.ejca.2012.08.013

1. Introduction

Colon cancer is one of the most frequent cancer types in the Netherlands with over 8000 new cases annually.[1] It is the second most frequent cause of cancer death in the Netherlands with almost 3900 deaths in 2010.[2] Colon cancer incidence increased in the Netherlands by almost 25% in the period 1989–2006, while mortality decreased by 10% in 1989–2007, resulting in a vastly increased prevalence of patients with colon cancer.[3]

Survival estimates for cancer patients, traditionally reported from the time of cancer diagnosis, are not necessarily applicable to patients who have already survived for some time after initial diagnosis and treatment. Over 30% of the patients with curable colon cancer will relapse with metastatic disease within 5 years of diagnosis.[4] Therefore, standard survival curves at diagnosis of colon cancer are rather pessimistic since they are based on all patients, including those who died within the first few years. Conditional survival analysis is a method for estimating the survival rate, for those who have already survived for a certain period of time.[5]

Such survival estimates seem useful for cancer survivors yielding more relevant information about prognosis, which can be used for personal health-related planning and by treating physicians for planning cancer surveillance.[6,7] Furthermore, it gives information about excess mortality caused by the disease, treatment and comorbidity. Most previous studies on conditional survival for patients with colorectal cancer (CRC) only reported on patients who had survived 1 year[8,9] or up to 5 years after diagnosis,[10–12] while only a few studies included patients with CRC who had survived for more than 5 years.[7,13,14]

With the marked increase in the number of long-term colon cancer survivors, there is a growing need for more up-to-date and subgroup-specific analysis of conditional survival. In this study we determined conditional 5-year relative survival rates for colon cancer patients, according to age, gender and tumour stage for each additional year survived up to 15 years after diagnosis.

2. Methods

2.1. Data collection

Population-based data from the nationwide Netherlands Cancer Registry (NCR), which was started in 1989 and is maintained and hosted by the Comprehensive Cancer Centres, were used.[1] The NCR is based on notification of all newly diagnosed malignancies in the Netherlands by the automated pathological archive (PALGA). Additional sources are the national registry of hospital discharge diagnoses, which accounts for up to 8% of new cases.[1] Information on patient characteristics such as gender and date of birth, as well as tumour characteristics such as date of diagnosis, subsite (International Classification of Diseases for Oncology (ICD-O-3)[15]), histology, stage (Tumour Lymph Node Metastasis (TNM) classification[16]) and grade, are obtained routinely from the medical records about 9 months after diagnosis. The quality of the data is high, due to thorough training of the registrars and computerised consistency checks at regional and national levels. Completeness is estimated to be at least 95%.[17] In addition to passive follow-up via the hospitals, date of death is also retrieved from the Municipal Personal Records Database. This database contains all deaths or emigrations in the Netherlands since October 1994. For patients diagnosed before October 1994, follow-up was completed by merging with municipality death records or with the Central Bureau for Genealogy, which registers all deaths in the Netherlands.[1] Since this is an observation study, we followed the STROBE checklist.[18]

For the present study, all cases of invasive primary colon cancer (C18.0–C18.9) stage I–III diagnosed in the period 1989–2008 in the Netherlands were included ($n = 89{,}451$). Follow-up of vital status was complete until January 2010.

Patients younger than 15 years and older than 89 years were excluded from the analysis, as well as cases diagnosed at autopsy and patients with sarcomas or lymphomas located in the colon. The very old patients were excluded since conditional survival estimates are unreliable for these patients. Age was divided into four groups (15–44, 45–59, 60–74, 75–89 years). Patients aged 15–29 and 30–44 years were merged, because of the small number of patients. Tumour localisation was categorised into anatomical subsites: (1) proximal colon, consisting of the coecum, appendix, ascending colon, hepatic flexure, transverse colon and splenic flexure (C18.0–C18.5); (2) distal colon, consisting of the descending colon and sigmoid colon (C18.6–C18.7); and (3) unknown or overlapping subsites of the colon (C18.8, C18.9) (2%). Stage was based on the pathological TNM classification. When the pathological stage was unknown (1.6%), the clinical stage was used.

2.2. Statistical analyses

Relative survival is an approximation of disease-specific survival. It is calculated as the absolute survival among cancer patients divided by the expected survival of a comparable group from the general population (same period, age, and gender). Expected survival was calculated from population life tables from the Netherlands, according to the Ederer II method.[19]

Period analysis[20–22] was used to provide up-to-date survival estimates; all observations included in the analysis are left-truncated at the beginning of the period of interest, in addition to being right-censored at its end.