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Original Research

Is low survival for cancer in Eastern Europe due principally to late stage at diagnosis?

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Abstract ***Background:*** Cancer survival has persistently been shown to be worse for Eastern European and UK/Ireland patients than those of other European regions. This is often attributed to later stage at diagnosis. However, few stage-specific survival comparisons are available, so it is unclear whether poorer quality treatment or other factors also contribute. For the first time, European cancer registries have provided stage-at-diagnosis data to EUROCARE, enabling population-based stage-specific survival estimates across Europe.
Data and methods: In this retrospective observational study, stage at diagnosis (as TNM, condensed TNM, or Extent of Disease) was analysed for patients (≥15 years) from 15 countries grouped into 4 regions (Northern Europe: Norway; Central Europe: Austria, France, Germany, Switzerland, The Netherlands; Southern Europe: Croatia, Italy, Slovenia, and

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Spain; and Eastern Europe: Bulgaria, Estonia, Lithuania, Poland, and Slovakia), diagnosed with 7 malignant cancers in 2000–2007, and followed to end of 2008. A new variable (reconstructed stage) was created which used all available stage information. Age-standardised 5-year relative survival (RS) by reconstructed stage was estimated and compared between regions. Excess risks of cancer death in the 5 years after diagnosis were also estimated, taking age, sex and stage into account.

Results: Low proportions of Eastern European patients were diagnosed with local stage cancers and high proportions with metastatic stage cancers. Stage-specific RS (especially for non-metastatic disease) was generally lower for Eastern European patients. After adjusting for age, sex, and stage, excess risks of death remained higher for Eastern European patients than for European patients in general.

Conclusions: Late diagnosis alone does not explain worse cancer survival in Eastern Europe: greater risk of cancer death together with worse stage-specific survival suggest less effective care, probably in part because fewer resources are allocated to health care than in the rest of Europe. We recommend that Eastern European cancer registries and other involved bodies to draw attention to poor cancer survival, so as to stimulate research and inform policies to improve outcomes.

1. Introduction

EUROCARE, the continuing population-based investigation of European cancer survival, found that the well-known between-country differences in 5-year relative survival (RS) persisted for patients diagnosed in 2000–2007 [1,2], latest period for which data are available. Survival was confirmed as low for Eastern European and UK/Ireland patients and high for Northern and Central European patients. Differences in cancer biology, intensity of screening, extent of diagnostic workup, quality of care, and organisation of care delivery contribute to these inequalities [1], but stage at diagnosis is also important [3], as shown by analyses of the influence of diagnostic work-up, stage, and treatments on survival in random samples of cancer registry (CR) cases (collecting clinical data on all cases is too resource-intensive) [4–6].

The present retrospective observational study provides the first Europe-wide population-based estimates of stage distribution at diagnosis and stage-specific RS for selected cancers and CRs, for which the stage information sent to EUROCARE-5 was considered to be of sufficiently high quality.

2. Materials and methods

The EUROCARE-5 protocol [7] asked CRs to send data—specifically including stage at diagnosis, on adult (≥15 years) patients diagnosed with 15 types of cancer in 2000–2007 and followed to the end of 2008.

Although stage is an essential element of CR data [8], not all European CRs collect it, and many experience difficulties in accessing and coding it [9,10]. The protocol therefore requested stage be provided in *one or more* of 3 forms [7]: TNM (most detailed), condensed TNM, and (summary) extent of disease (EoD; least detailed). EoD is used by CRs to summarise stage by indicating how far a cancer has spread from its point of origin, using all available information [11]. The protocol did not specify whether clinical or pathological stage should be sent, but if both were available, pathological stage was preferred for non-metastatic cases, as information on metastasis is usually available from clinical stage. Of the 62 CRs that sent stage-at-diagnosis information, 22 provided TNM only, 15 EoD only, 1 condensed TNM only, and 24 stage in two or more forms [10].

Before analysis, the categories of the three staging systems were reduced to mutually compatible ones as described elsewhere [10] and illustrated in Supplementary Fig. 1 (Fig. S1). A new variable, *reconstructed stage* (categories local, regional, metastatic, and unknown) was then produced by replacing unknown TNM information with information (where available) from condensed TNM, EoD, or both, thereby minimising the amount of missing information.

The quality of stage information was analysed next [10]. For only 7/15 cancers (breast, colon, rectum, skin melanoma [subsequently melanoma], thyroid, lung and stomach; defined elsewhere [12], and for only 34 CRs (Fig. 1, Table S1) from 15 countries in 4 regions (Northern Europe: Norway; Central Europe: Austria, France, Germany, Switzerland, The Netherlands; Southern Europe: Croatia, Italy, Slovenia, and Spain; and Eastern Europe: Bulgaria, Estonia, Lithuania, Poland and Slovakia), did stage information conform to our quality criteria [10], permitting its inclusion in the analyses here presented. The populations (2000–2007 averages) covered by these CRs ranged from 76,931,725 for breast cancer (17% of the