

RESEARCH

Open Access



# The mortality rate of people with cancer judged to have a limited life expectancy by physicians performing work disability assessments in the Netherlands: a retrospective cohort study

Jetske A. Kraan<sup>1\*</sup>, Michiel A. Greidanus<sup>2,3</sup>, Sietske J. Tamminga<sup>2,3</sup> and Jan L. Hoving<sup>2,3,4</sup>

## Abstract

**Purpose** There is a lack of consensus among physicians working in the field of disability assessment about the definition of a limited life expectancy. The aim of this study was to describe the mortality rate of employees with cancer who were judged to have a limited life expectancy and to study whether factors are associated with mortality.

**Methods** A retrospective cohort study, including 534 Dutch employees with a diagnosis of cancer who were granted full work disability pension after being judged by physicians working in the field of disability assessment as having a limited life expectancy. Descriptive statistics were used to describe the one- and two-year mortality rates. Factors potentially associated with mortality were studied using univariate logistic regression analysis.

**Results** The mortality rates one and two years after the disability assessment were 46% ( $n = 247$ ) and 63% ( $n = 339$ ), respectively. We did not observe a statistically significant association between age at death or between sex and death after one year, but after two years the probability of death was greater among men. Both one and two-years after the disability assessment, the probability of dying was greater among employees diagnosed with a digestive type of cancer, compared to employees diagnosed with a urogenital type of cancer.

**Conclusions** Approximately six in ten people died within two years of their work disability assessment. In addition to the type of cancer, no factors in this study were associated with mortality. Physicians should be supported in making evidence-based assessments of life expectancy in patients with cancer.

**Keywords** Social security, Prognosis, Cohort studies, Limited life expectancy, Mortality

\*Correspondence:

Jetske A. Kraan  
jetske.kraan@uwv.nl

<sup>1</sup>Department of Social Medical Affairs (SMZ), The Dutch Social Security Institute, The Institute for Employee Benefits Schemes (UWV), La Guardiaweg 94-114, Amsterdam 1043 DL, The Netherlands

<sup>2</sup>Department of Public and Occupational Health, Amsterdam UMC location University of Amsterdam, Meibergdreef 9, Amsterdam, The Netherlands

<sup>3</sup>Amsterdam Public Health Research Institute, Societal Participation and Health, Amsterdam, The Netherlands

<sup>4</sup>Research Centre for Insurance Medicine (KCVG), Amsterdam, The Netherlands



© The Author(s) 2025. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

## Introduction

Approximately 1.8 million people are diagnosed with cancer in Europe each year [1]. The life expectancy of people with cancer has improved over the years, from an average 5-year survival rate of 39% in the early 1960s, to a current 68%. This is mainly due to earlier diagnosis and improved treatment [2]. However, a considerable number of people are diagnosed with cancer are still not able to survive such a period.

For physicians, judging a person's life expectancy is crucial, first and foremost to the person who is diagnosed with cancer. However, judging the life expectancy of a person diagnosed with cancer can be challenging for physicians. For instance, physicians tend to overestimate the survival of patients with advanced incurable cancer [3]. Furthermore, several studies have shown that these predictions can even range from an underestimation of 50% to an overestimation of 600% [4–6]. Medical research has not reached a consensus on what a limited life expectancy is, and variable periods ranging from a few weeks to several years have been reported [7].

Specifically for physicians working in the field of disability assessment, judging the life expectancy of a worker with cancer can be challenging because of the consequences of their assessment for the employee's financial compensation. A recent study showed that Dutch physicians working in the field of disability assessment experience ethical and moral dilemmas, such as acting in accordance with respect for autonomy and equity, fairness and impartiality, and care and involvement, when assessing the life expectancy of employees with cancer [8]. Compared with other medical disciplines, there is no consensus within this field regarding what a limited life expectancy is, and definitions of a limited life expectancy range from 1 to 2 years to 5–10 years [9].

Judging the life expectancy of employees with cancer is important for Dutch physicians working in the field of disability assessment. Dutch law states that a full assessment with a labor expert can be waived when someone has either no functional work capabilities at the time of the assessment or is expected to lose these capabilities within the foreseeable future because of a limited life expectancy [10]. What constitutes the foreseeable future has not been specified. However, Dutch physicians working in the field of disability assessment must register this into a category that is entitled 'the loss of work capabilities within 3 months to a year' [11]. Because of this category, it could be assumed that the foreseeable future in which someone is expected to lose their work capabilities because of a limited life expectancy is within one year of the assessment.

Because of the difficulty of judging the life expectancy of persons diagnosed with cancer, the lack of a definition of the foreseeable future and a lack of consensus among

physicians working in the field disability assessment about the definition of a limited life expectancy, it is crucial to gain insight into the actual duration of an employee's life after such an assessment by a physician working in the field of disability assessment. In the future, this could be used to inform these physicians when judging the life expectancy of an employee with cancer. Furthermore, it could help formulate an unambiguous definition of a limited life expectancy to be used by physicians working in the field of disability assessment.

Therefore, this study aimed: (1) to describe the one- and two-year mortality rates of employees with cancer who were judged by physicians working in the field of disability assessment as having a limited life expectancy, and (2) to study what factors are associated with dying within these periods.

## Methods

This study was reported using the STROBE statement [12].

### Study design and setting

This was a retrospective cohort study in which routinely collected and anonymised registry data from the Dutch Social Security Institute (SSI) were used. In the Netherlands, a physician working for the SSI assesses whether a sick-listed employee qualifies for a disability pension. Dutch social security legislation allows an employee a period of paid sick leave of two years. During this period, the employer is obligated to pay a person's salary and provide return-to-work support. This is called the "waiting period". After this period, a physician will assess the employee's qualification for a disability pension. This assessment, in short, is first based on someone's functional limitation(s), and when this limitation is not considered life threatening or severe, it is based on the amount of income that someone can earn given his/her functional limitation(s). It is also possible to request an assessment between the 3rd and 68th week of sick leave in the case of a severe, advanced, and/or an incurable disease. This is called a "shortened waiting period assessment". Both types of assessments can only be requested by the employees themselves [13, 14].

### Cases

The Central Expertise Centre (CEC) of the SSI selected cases on the basis of the following inclusion criteria: (i) the employee's disability was assessed by the SSI in the period 1st of January 2017 and the 30th of June 2017, (ii) the employee was granted full disability pension, and (iii) the diagnosis of cancer was included in this assessment. JK performed the final selection of cases based on the medical files of selected cases between July 2019 until January 2020. Cases were included if the physician reported

(i) that the employee had a limited life expectancy because of a cancer diagnosis, (ii) that the employee was diagnosed with a cancer diagnosis with a poor prognosis (this was defined by the physician writing that the client was granted full benefits because of a poor prognosis), or (iii) that the employee received palliative care for cancer. Only cases with a full or shortened waiting period were included. Cases were excluded if the medical file showed that the cancer diagnosis was a secondary diagnosis and not the main reason for the disability assessment or when one or more of the abovementioned criteria could not be verified. All cases were between 18 and 65 years of age at the time of the disability assessment, in accordance with the statutory retirement age at that time.

### Variables

All variables were retrieved from the medical files of the selected cases.

### Descriptive variables

The following characteristics were retrieved from the medical files: age at the time of assessment (in years), sex (male/female) and cancer diagnosis, which is based on the CAS codes, which are, in turn, based on the ICD-10 [15]. These CAS codes were then categorised into the following cancer types: “general” (a type of cancer that cannot be placed under one of the other categories. For example a metastatic form of cancer of unknown origin.), “blood”, “dermatologic”, “endocrine”, “ear/hearing”, “bone and muscular”, “neurological”, “respiratory”, “digestive”, “urogenital (including breast cancer)”, “visual” and “cancers of multiple organ systems”. For the statistical analysis the urogenital cancers were split into breast cancer and other urogenital types of cancers, because breast cancer should be considered an entity on its own.

### Primary outcome – mortality rate

The primary outcome was the mortality rate within one and two years of disability assessment by the physician. This was calculated as the number of cases who died within one and two years after the disability assessment relative to the total number of cases. The municipality automatically reports the death to the ISS so that the payment of the benefits can be stopped. The CEC provided the date of death with the selected cases.

### Factors potentially associated with dying within one and two years of disability assessment

The following factors were studied to determine whether they were associated with dying one or two years after disability assessment: sex (male: reference vs. female), age (18–39: reference; 40–49; 50–65), type of assessment (full: reference vs. shortened waiting period) and type of cancer diagnosis (digestive: vs. urogenital (reference)).

### Statistics

Statistical analyses were performed with IBM SPSS for Windows version 26.0. Descriptive statistics, including mortality rate, were used to describe the selected cases. Factors potentially associated with death within one and two years of disability assessment were examined with univariate logistic regression analysis. A two-tailed *p* value of  $<0.05$  was considered to indicate statistical significance. Since all the data could be retrieved from the persons' medical files, there were no missing data.

### Results

#### Patient flow

A total of 576 cases were selected by the CEC of the SSI based on the inclusion criteria. After reviewing these cases, 42 were excluded because either the medical file was not available ( $N=14$ ), the medical file did not report a limited life expectancy, poor prognosis or palliative care ( $N=21$ ), or because the cases did not meet the criteria of a shortened or regular waiting period ( $N=7$ ). The other 534 cases were included in this study (Fig. 1).

#### Description of the included cases

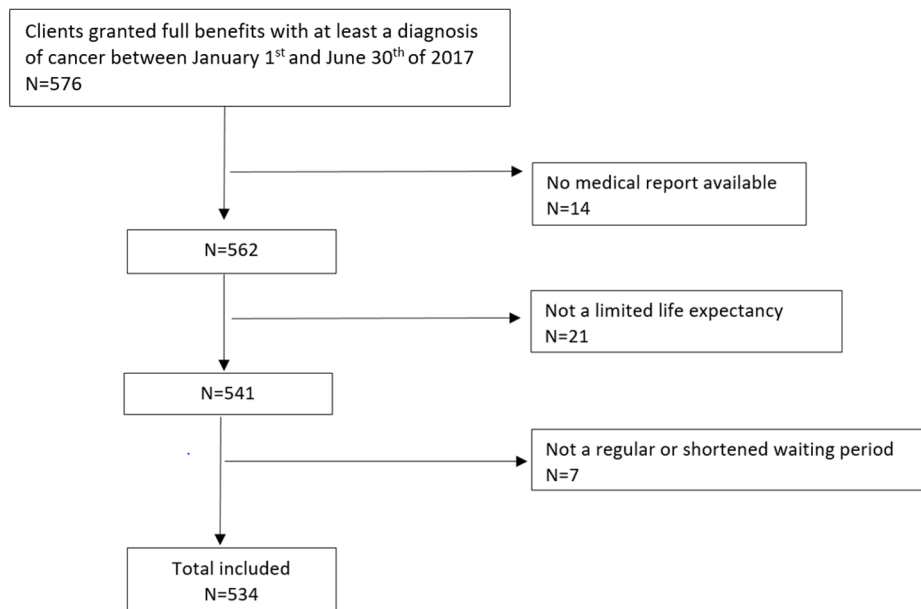
Of the 534 included cases, 229 (43%) were men and the mean age at assessment was 54.6 years (standard deviation (SD)=7.9). In 240 (45%) cases, the disability assessment was performed at the end of the regular two-year waiting period. Twelve different types of cancer were reported, of which cancer of the digestive system was the most frequent:  $n=127$  (24%).

#### Mortality rate and factors potentially associated with mortality

The mortality rates at one and two years after the disability assessment were 46% ( $n=247$ ) and 63% ( $n=339$ ), respectively (Table 1). The highest mortality rate was reported for bone and muscular cancer, and the lowest for endocrine cancer and cancer in the ear/hearing system (Table 1).

We did not observe any statistically significant association between age and death one or two years after the disability assessment (Table 2). We also did not observe any statistically significant association between sex and death after one year (OR 0.73, 95% CI 0.52–1.04), while the probability of dying was greater among men two years after assessment (OR 0.57, 95% CI 0.39–0.82) (Table 2).

Both at one and two-years after the disability assessment, the probability of dying was greater among the group of employees who were assessed after the shortened waiting time assessment than among the group of employees who were assessed after the regular waiting time (OR 1.44, 95% CI 1.02–2.36 and OR 1.45, 95% CI 1.01–2.06 respectively).



**Fig. 1** Case flow

**Table 1** Number of cases that were and were not deceased by type of cancer after one and two years of the disability assessment

Type of cancer diagnosis	One year after disability assessment (n = 534)		Two years after disability assessment (n = 534)	
	Deceased n (%)	Not deceased n (%)	Deceased n (%)	Not deceased n (%)
General	2 (100%)	0 (0%)	2 (100%)	0 (0%)
Blood	2 (17%)	10 (83%)	5 (42%)	7 (58%)
Breast cancer	38 (36%)	69 (64%)	50 (48%)	55 (52%)
Dermatologic	7 (37%)	12 (63%)	8 (42%)	11 (58%)
Endocrine	0 (0%)	5 (100%)	1 (20%)	4 (80%)
Ears/hearing	0 (0%)	1 (100%)	0 (0%)	1 (100%)
Bone and muscular	7 (78%)	2 (22%)	8 (89%)	1 (11%)
Neurological	15 (50%)	18 (55%)	24 (73%)	9 (27%)
Respiratory	56 (45%)	68 (55%)	74 (60%)	50 (40%)
Digestive	81 (64%)	46 (36%)	101 (80%)	26 (21%)
Urogenital	34 (39%)	53 (61%)	56 (64%)	31 (36%)
Visual	1 (50%)	1 (50%)	1 (50%)	1 (50%)
Cancers of multiple organ systems	4 (67%)	2 (33%)	4 (67%)	2 (33%)
Total	247 (46%)	287 (54%)	339 (63%)	195 (37%)

Both one and two years after disability assessment, the probability of dying was greater among employees diagnosed with a digestive type of cancer than among employees diagnosed with a urogenital type of cancer (OR 2.75, 95% CI 1.56–4.82 and OR 2.15, 95% CI 1.16–3.98, respectively).

**Discussion**

Currently, there is no consensus among physicians in general on what should be considered a limited life expectancy or how to assess this in daily practice [7]. In this study employees with cancer qualified for a full work disability pension after a physician of the SSI established

the presence of a limited life expectancy. The observed life expectancy was indeed limited for a substantial proportion of persons assessed by the physicians, as indicated by the one- and two-year mortality rates of 46% and 64% respectively.

We showed that employees who requested an early assessment within 68 weeks after the start of their sick leave (i.e. short waiting period) had a greater mortality rate than those who did not receive an early assessment. An explanation could be that an earlier assessment may be requested by persons with a lower perceived life expectancy who do not expect to survive the normal waiting period of two years. Not surprisingly, we

**Table 2** Factors potentially associated with death one and two years after the disability assessment

		One year after disability assessment			Two year after disability assessment		
		Deceased (n = 247) n (%)	Not deceased (n = 287) n (%)	OR (95%CI)	Deceased (n = 339) n (%)	Not deceased (n = 195) n (%)	OR (95%CI)
Age	22–39	13 (43%)	17 (57%)	Reference	16 (53%)	14 (47%)	Reference
	40–59	147 (45%)	178 (55%)	1.08 (0.51–2.30)	206 (63%)	119 (37%)	1.52 (0.71–3.21)
	60–65	87 (49%)	92 (51%)	1.24 (0.57–2.70)	117 (65%)	62 (35%)	1.65 (0.76–3.60)
Sex	Male	116 (51%)	113 (49%)	Reference	162 (71%)	67 (29%)	Reference
	Female	131 (43%)	174 (57%)	0.73 (0.52–1.04)	177 (58%)	128 (42%)	0.57 (0.39–0.82)*
Waiting period	Regular	99 (41%)	141 (59%)	Reference	141 (59%)	99 (41%)	Reference
	Short	148 (50%)	146 (50%)	1.44 (1.02–2.04)*	198 (67%)	96 (33%)	1.45 (1.01–2.06)*
Cancer diagnosis group	Digestive	81 (64%)	46 (36%)	2.75 (1.56–4.82)*	101 (80%)	26 (21%)	2.15 (1.16–3.98)*
	Urogenital	34 (39%)	53 (61%)	Reference	56 (64%)	31 (36%)	Reference

\* $P < 0.05$ 

observed variability in the mortality rates between different cancer diagnoses. Our results indicate that a diagnosis of breast cancer is associated with better survival than the other types of cancer. This could be due to the extensive treatment options for breast cancer patients, as are those who are treated with palliative intent [16]. Decision making could be improved if this study was repeated with a more extensive dataset containing more variables such as cancer stage. This would allow for multivariate analyses and explore and adjust for any (other) factors.

The introduction of evidence-based medicine in the field of work disability evaluation has proven successful in facilitating decision making by physicians, including prognosis assessment [17, 18]. Unfortunately, professional guidelines in this field are missing or outdated. This is illustrated by the 2007 Dutch protocol for the work disability assessment of people with breast cancer, which reports a relative survival of 1.5 to 2 years [19]. However, more recent evidence shows a median overall survival of 29.8 months for patients with metastatic breast cancer and up to 37.0 months for patients with hormone receptor-positive cancers [19]. Therefore, it is important that professional guidelines are kept up to date by adding new evidence-based information, since improvements in cancer diagnosis and treatment may have a rapid impact on survival [2].

The people included in this study were granted a full and permanent disability pension because the physician concluded that they had a limited life expectancy. This study does not provide insight into the work capacity of people who were still alive one or two years after receiving a full disability pension. Predicting life expectancy and a person's capacity to work is challenging. When considering a person's work capacity, other factors, such as quality of life should be also be considered. These and other personal and work-related factors should be of interest in future studies.

Personal preferences regarding end-of-life decisions, including participation in work, may also play a role.

Although some cancer patients may wish to stop work to increase or maintain their quality of life, others may wish to continue working as long as they are able to. Dutch physicians working for SSI have professional decision latitude in assessing patients with poor life expectancies and should consider employees' views on their work capacity and plans to (dis)continue working [20]. Employees who opt to continue working will not have been granted a full disability pension and were therefore not included in this study even though they had a limited life expectancy. Exploring the decision to stop or keep working should provide more insight into the challenges associated with cancer experience, and enable the provision of interventions and support to assist both employees and physicians in this decision-making process during work disability assessments.

A limitation of this study is that establishing the cause of death was not possible for practical and legislative reasons. For the purpose of this study, we assumed that the cancer itself or a cause related to the cancer was the cause of death. Because the cause of death is unknown, the one-year mortality rate of 46% might be an overestimation compared with the mortality rate due to cancer. Therefore, we recommend that further research take into account the cause of death.

#### Implications for Research and Practice.

Because there is no protocol or guideline that states what life expectancy should be considered limited, it could help physicians working in the field of disability assessment if a clearer and more precise definition is available of what constitutes a limited life expectancy. This should be supported by up-to-date evidence based on recent cancer survival data and the provision of up-to-date protocols or guidelines on the work disability assessment of employees with cancer.

#### Abbreviations

CAS	Classificaties voor Arbo en SV
CEC	Central Expertise Centre
CI	Confidence interval

ICD International Classification  
 OR Odds ratio  
 SSI Social Security Institute  
 SMZ Sociaal Medische Zaken  
 UWV Uitvoeringsinstituut Werknemersverzekeringen

#### Acknowledgements

Not applicable.

#### Author contributions

JK developed the study concept, designed the study, collected and interpreted the data, and drafted the manuscript. ST conducted statistical analyses, helped to interpret the data, and helped to draft the manuscript. MG and JH helped to interpret the data, and helped to draft the manuscript. All authors read and approved the final manuscript.

#### Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

#### Data availability

The data that support the findings of this study are available from the Dutch Social Security Institute: The Institute for Employee Benefits Schemes (UWV), but restrictions apply to the availability of these data, which were used under licence for the current study and so are not publicly available. The data are, however, available from the authors upon reasonable request and with permission of the Dutch Social Security Institute: The Institute for Employee Benefits Schemes (UWV).

#### Declarations

##### Ethics approval and consent to participate

According to the Medical Ethics Committee of the University Medical Centre Utrecht, the study was declared to not fall within the scope of the Dutch Medical Research Involving Human Subjects Act. Ethical approval was obtained from the Utrecht Medical Ethics Committee and the study was carried out according to the following ethical guidelines: confirmed 5th of May 2020 under reference number WAG/mb/20/016691. Individual consent to participate was not obtained because the review committee of the SSI judged this to be unnecessary for families of participants who had died. The research was believed to serve a public interest, and the data were processed anonymously.

##### Consent for publication

Not applicable.

##### Competing interests

The authors declare no competing interests.

Received: 24 April 2024 / Accepted: 10 March 2025

Published online: 23 March 2025

#### References

- de Boer AG. The European cancer and work network: CANWON. *J Occup Rehabil*. 2014;24(3):393–8.
- American Cancer Society. *Cancer Facts & Fig*. 2021. Atlanta: American Cancer Society; 2021.
- Gramling R, Gajary-Coots E, Cimino J et al. Palliative Care Clinician Overestimation of Survival in Advanced Cancer: Disparities and Association With End-of-Life Care [published correction appears in *J Pain Symptom Manage*. 2019;58(4):e19–e20]. *J Pain Symptom Manage*. 2019;57(2):233–240.
- Cheon S, Agarwal A, Popovic M, Milakovic M, Lam M, Fu W, et al. The accuracy of clinicians' predictions of survival in advanced cancer: a review. *Annals Palliat Med*. 2015;5(1):22–9.
- White N, Reid F, Harris A, Harries P, Stone PA. Systematic review of predictions of survival in palliative care: how accurate are clinicians and who are the experts? *PLoS ONE*. 2016;11(8):e0161407.
- Amano K, Maeda I, Shimoyama S, Shinjo T, Shirayama H, Yamada T, et al. The accuracy of physicians' clinical predictions of survival in patients with advanced cancer. *J Pain Symptom Manag*. 2015;50(2):139–e461.
- Rogg L, Graugaard PK, Loge JH. Physicians' interpretation of the prognostic term terminal: a survey among Norwegian physicians. *Palliat Support Care*. 2006;4(3):273–8.
- Van Till-van Zinnicq Bergmann S, Noordik E, Hoving J. [In Dutch] Morele dilemma's Bij de WIA-beoordeling. Mensen Met Een beperkte levensverwachting door Kanker [Moral dilemmas in the disability assessment. People with a limited life expectancy due to cancer]. *TBV - Tijdschr Bedrijfs- En Verzekeringsgeneeskd*. 2021;29:38–43.
- Muller E, Hoving J. [In Dutch] Visie Van Verkekeringsartsen op de claim-beoordeling Van mensen Met Een beperkte levensverwachting [Physicians working in the field of disability assessment view on the disability assessment of people with a limited life expectancy]. *TBV - Tijdschr Bedrijfs- En Verzekeringsgeneeskd*. 2018;26:533–7.
- [In. Dutch] Schattingsbesluit arbeidsongeschiktheidswetten [Disability Laws Estimate Decree]. *Staatscourant* 2000;151.
- [In. Dutch] basisinformatie claim Beoordelings- En Borgings systeem [Basic information claim assessment and assurance system ], version 15-04-2013, Amsterdam: UWV.
- <https://www.strobe-statement.org/>
- [In Dutch] Wet werk en inkomen naar arbeidsvermogen [Work and Income according to Labor Capacity Act]. *Staatscourant* 2005;572.
- de Rijk A. Work Disability prevention in the Netherlands: A Key Role for Employers. In: MacEachen E, editor. *The Science and Politics of Work Disability Prevention*. 1st edition ed. New York: Routledge. 2018; 223–41.
- [In Dutch] CAS Classificaties voor Arbo en SV [CAS Classifications for Occupational Health and Safety], 3rd ed, UWV; November 2002.
- Krijger-Vossen V, Weel A. [In Dutch] Toegenomen overlevingsduur Bij Gemetastaseerd mammacarcinoom [Increased survival in metastatic breast cancer]. *TBV - Tijdschr Bedrijfs- En Verzekeringsgeneeskd*. 2020;28:50–4.
- Kok R, Hoving JL, Verbeek J, Schaafsma FG, van Dijk FJ. Integrating evidence in disability evaluation by social insurance physicians. *Scand J Work Environ Health*. 2011;37(6):494–501.
- Kok R, Hoving JL, Smits PB, Ketelaar SM, van Dijk FJ, Verbeek JH. A clinically integrated post-graduate training programme in evidence-based medicine versus 'no intervention' for improving disability evaluations: a cluster randomised clinical trial. *PLoS ONE*. 2013;8(3):e57256.
- [In. Dutch] Verkekeringsgeneeskundig protocol Borstkanker [Medical disability assessment protocol breastcancer]. *Gezondheidsraad*; maart 2007.
- Valachis A, Carlqvist P, Ma Y et al. Overall survival of patients with metastatic breast cancer in Sweden: a nationwide study. *Br J Cancer* (2022).

#### Publisher's note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.