Prevalence of oncologists in distress: systematic review and meta-analysis


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ABSTRACT

Objective: High mortality from cancer and rising patient numbers can trigger distress among oncologists because of a heavy and emotionally demanding workload. This systematic review and meta-analysis assesses the prevalence of high levels of distress among oncologists.

Methods: The PRISMA protocol is registered at the PROSPERO international prospective register (Ref. 2015:CRD42015016325). We categorized data items according to the following distress factors: burnout, psychiatric morbidity, stress, depression, disrupted sleep, stress-induced physical symptoms, and substance use. We meta-analysed the prevalence of burnout and psychiatric morbidity using random effects models with MetaXL software.

Results: The meta-analyses showed that 32% of 4876 oncologists had high burnout (±CI 28% to 36%) and 27% of 2384 had high psychiatric morbidity (±CI 23% to 32%). Studies also showed that 42 to 69% feel stressed at work, > 12% of oncologists screen positive for depression, many oncologists suffer from sleep deprivation, up to 30% drink alcohol in a problematic way, up to 20% of junior oncologists use hypnotic drugs and some frequently experience stress-induced complaints such as ulcers, gastric problems, headaches and arrhythmia.

Conclusions: Occupational distress reduces career satisfaction, affects patient care and increases the chances of oncologists switching to another area of medicine therefore future research should explore appropriate interventions.

Keywords: stress, burnout, psychiatric morbidity, sleep, meta-analysis, oncology, cancer.
BACKGROUND

High mortality from cancer [1-3] and rising patient numbers [4] can put oncologists at risk of distress because of a heavy workload and the emotional demands of the job. Cancer is one of the biggest causes of premature adult death [5] with an estimated 1,000 people diagnosed with cancer each day [5], making oncology one of the fastest-growing and in-demand medical specialties. At diagnosis, the proportion of terminally ill cancer patients can be as high as 49% for lung cancer, 21.6% for colorectal cancers and 17% for ovarian cancers [6] with low 1-year survival rates (e.g., 14% for lung cancer) [7]; therefore, oncologists experience more frequent patient death than doctors in many other specialties. Studies show that many oncologists experience high levels of distress, e.g. feeling emotionally exhausted or burned-out [8-11], having disturbed sleep [2], feeling depressed [12], using alcohol to cope [13], and experiencing stress-related health problems [9, 14]. For example, up to 44.7% of oncologists present high burnout [11], 27% present psychiatric morbidity [13] and 33% present depression [15]. To date, there has been no review or meta-analysis of the proportion of oncologists affected by occupational distress. Previous reviews [8, 9] either combined oncologists with other cancer staff or, when they focussed on just oncologists, reviewed only burnout and psychiatric morbidity.

Previous research suggests that oncologists experience job stressors that are embedded in their role as physicians within cancer care e.g. being responsible for diagnosing tumours and relaying bad news [16, 17]; managing a patient’s cancer care and weighing up the risks or benefits of treatment options such as radiotherapy, hormone therapy, surgery or palliation relative to the type, location and stage of the tumour [15, 16, 18]; supporting cancer patients and helping them make informed decisions [18]; managing patients’ expectations about
recovery from cancer [17]; seeing patients suffering [17, 18]; coping with patients’
disappointment about treatment outcomes [17]; witnessing anger or blame from patients [17, 18];
grief about a patient’s death [10]; and experiencing multiple patient deaths [17, 18]. As
well as the stressors embedded within their job roles, oncologists have a heavy workload;
most work in excess of 60 hours a week and remain on call outside their formal working
hours [12]. Occupational distress has a spill-over effect on the work and personal life of
oncologists [10], reduces career satisfaction [11, 12], raises the risk that oncologists will
decide to take early retirement [11] or leave oncology for another area of medicine [14] and it
has a detrimental effect on the quality of patient care [13]. We therefore systematically
reviewed and meta-analysed distress prevalence in studies about oncologists presenting
burnout, depression, psychiatric morbidity, sleep deprivation, stress, stress-induced health
complaints and substance abuse.

METHODS

The systematic review PRISMA protocol was registered a priori at the PROSPERO
international prospective register, available online [19].

Eligibility criteria, information sources and searches

We searched the Thomson Reuters Web of Science databases with no restrictions on
publication period or language. Eligible studies were quantitative and involved individual-
level data about the occupational distress of doctors working in specialties with high rates of
patient mortality such as palliative medicine, oncology, HIV/AIDS care and other areas of
medicine involving patients with life-limiting illnesses. This article reports results about
oncologists that emerged from the wider systematic review. We searched the databases using
specialty keywords [palliative or end-of-life or hospice or AIDS or HIV or cancer or oncolog*
or “last stage* of life” or “life-limit*” or terminal] combined with profession keywords [doctor or physician or intern or resident or “house officer*” or registrar or consultant or fellow] and occupational distress keywords [stress or depress* or anxiety or fatigue or “occupational health” or sleep or alcohol or addiction or absence or absenteeism or sick or burnout or exhaust* or mood or grief or emotion].

**Study selection and data collection**

At the screening stage, we selected articles based on their titles and abstracts, compiling them in an *EndNote* database. In the next stage, we retrieved and reviewed the full text of the selected articles for assessment. Publications in other languages were translated, including Chinese, German, Spanish, Danish, Hungarian, Polish and Russian. In the final stage, we analysed relevant articles and formulated conclusions according to each factor and subset of groups, including oncologists.

**Data items and summary measures**

The data items that we sought from the publications are as follows and categorised by distress factor. We systematically reviewed all distress indicators and, where a uniform method of measuring distress was used by publications in each category, we meta-analysed distress prevalence.

1. **Burnout**: We systematically reviewed burnout studies and then meta-analysed the prevalence of high burnout among oncologists from publications that used the same psychometric test (the *Maslach Burnout Inventory*, MBI) [20]. In this article, we focus on one sub-type of burnout called emotional exhaustion because previous research shows that it psychometrically best represents overall burnout [20]. Example
items measuring emotional exhaustion are “I feel emotionally drained from my work” and “I feel used up by the end of the workday.”

2. **Psychiatric morbidity**: We systematically reviewed and meta-analysed the prevalence of high psychiatric morbidity among oncologists from publications that used the *General Health Questionnaire-12* (GHQ) [21]. Example items are: “Have you recently lost much sleep over worry?” and “Have you recently been able to face up to problems”

3. **Stress**: We systematically reviewed publications about the mean stress levels of oncologists, the proportion of oncologists with high stress levels, and causes of stress related to patient care. The stress inventories are listed within the tables in the results.

4. **Depression**: We systematically reviewed publications about mean depression levels and the proportion of oncologists with depression as assessed by depression symptom checklists or other depression inventories.

5. **Disrupted sleep**: We systematically reviewed publications about the mean sleep disruption levels of oncologists, as assessed by sleep deprivation inventories and sleepiness scales.

6. **Stress-related complaints**: We systematically reviewed publications about specific stress-related health complaints (e.g. gastric illnesses) and the mean scores on symptom checklists, listed within the results table.

7. **Alcohol/substance use**: We systematically reviewed publications about alcohol and substance use by oncologists relative to recommended levels.

**Results synthesis, meta-analyses and assessing the risk of bias**

During data extraction, we assessed the risk of bias by assessing the quality of each publication. We used a 10-point quality checklist built on existing quality assessment methods...
in systematic reviews [22-24]. In the checklist, items scored yes=1/no=0 for an appropriate sample size for the chosen data collection tools and study design; participants were likely to be representative of the target population; relevant confounders were controlled for; and appropriate statistical methods were used. Items scored from 1 to 3: the quality of the study design; and the validity and reliability of the data collection tools. Overall, a sum quality score lower than 4 showed low quality, a score between 5 and 7 showed moderate quality and a score equal to or higher than 8 showed high quality. We meta-analysed prevalence for burnout and psychiatric morbidity using random effects models (double arcsine transformation) with MetaXL software in Microsoft Excel [25]. Sensitivity analysis was performed for heterogeneity analysis [26]. The bias was analysed with funnel plots [26, 27]. The most popular tests for publication bias, Egger’s regression and Begg’s and Mazumdar correlation rank, were not used because of the small number of studies [28]. Instead, the results of the Luis Furuya-Kanamori (LFK) index of asymmetry are presented [25].

RESULTS

Study selection and characteristics

The search revealed 14763 hits with 663 publications eligible for full text analysis. Seventy-one articles were randomly selected for double assessment and the inter-observer agreement showed a high strength of agreement: Cohen’s kappa was statistically significant (p<0.000) and equal to 0.812 (95% CI 0.634 - 0.990). Following the full text assessment forty-three publications were eligible for further analysis because they measured the level of distress experienced by oncologists (see the PRISMA diagram in Figure 1). The publications comprised of: 17 studies that measured burnout [11-13, 16, 29-41]; 11 studies that measured psychiatric morbidity [13, 16, 29, 30, 36-38, 41-44]; 27 studies that measured stress [2, 17,
18, 33, 35-37, 41-43, 45-61]; six studies that measured depression [12, 31, 42, 62-64]; five studies that measured sleep deprivation [2, 42, 47, 56, 63]; four studies that measured stress-related conditions or symptoms [2, 17, 47, 51]; and five studies that measured substance use [12, 13, 32, 38, 47].

**Study characteristics**

The Forty-three eligible studies were published from 1990 to 2014 in more than 14 different countries: 12 studies from the USA [11, 12, 13, 31, 35, 48, 49, 51, 54, 60, 62, 64]; six from the UK [16, 36, 37, 41, 42, 59]; four from Canada [44, 50, 57-58]; three from Belgium [28, 46, 52]; two from Brazil [34, 40]; two from Germany [17, 18]; two from Denmark [45, 61], two from Italy [43, 47]; one each from Australia [38], Switzerland [29], Japan [30], France [32], Greece [53] and Turkey [2]; one study covering three European countries (Italy, Spain, and Portugal) [39]; one study covering two countries (Germany and Australia) [55]; one study from several European countries [63]; and one study covering three North American countries (USA, Canada, and Mexico) [56].

**Synthesis and analyses**

1. **How many oncologists are highly burned out?**

We meta-analysed 17 studies that used an identical measurement method, the 22-item MBI [20]. The percentage of oncologists with high emotional exhaustion varied from 23% to 48% (Table 1). The forest plot (Figure 2a) showed that on average 32% oncologists (95% CI 28-36) had high burnout, defined as high emotional exhaustion. Heterogeneity was observed (p<0.0001; Q=141.83) with inconsistency (I²) of 89% (95% CI 84-92). However, sensitivity analysis did not reveal any outliers: exclusion of any given study did not change the pooled prevalence by more than 0.01 points and it did not improve heterogeneity measures (the p
value for Q remained smaller than 0.0001 and inconsistency dropped to just 83%). To assess publication bias, we funnel plotted prevalence (Figure 2b). There was no asymmetry and no concentration, showing a low bias risk. The LFK index also showed no asymmetry (LFK=-0.72).

2. How many oncologists have high psychiatric morbidity?

We meta-analysed 11 studies that used the GHQ-12 scale and calculated the proportion of oncologists with psychiatric morbidity in the same way (≥4) [21]. The proportion of oncologists with high psychiatric morbidity varied from 12% to 36% (Figure 3a). The forest plot (Figure 3b) showed that an average of 27% oncologists (95% CI 23-32) suffered from psychiatric morbidity. Analysis showed heterogeneity (p<0.0001; Q=47.33) with inconsistency (I²) of 79% (95% CI 63-88). After excluding the study with the largest weight [41], inconsistency measures improved (I²=64%). However, 95% CI became wider (95% CI 30-81) and pooled prevalence dropped just 1%. The funnel plot (Figure 3b) showed minor asymmetry and the LFK index showed major asymmetry (LFK=-2.08). Opposite to the general tendency, this analysis showed that smaller studies less often presented results with large sizes.

3. How severe is work stress in oncology and what are the causes?

The publications that we reviewed in Table 2 reported mean stress or the proportion of oncologists who had high stress. Between 42% and 69% of oncologists felt stressed at work. We also looked at the stress levels linked to patients care and present these studies in a supplementary file. Oncologists report finding the following patient care situations stressful:

(a) Coping with patient deaths occurrences [17, 18, 42, 43, 53, 54, 56].

(b) Working with distressed or blaming relatives of cancer patients [35, 41, 42, 53, 59].
(c) Coping with a patient’s suffering during cancer treatment [17, 18, 36, 37, 41, 43, 49, 53-56].

(d) Feeling disappointed about cancer treatment options and questioning the meaning of job [17, 18, 42, 54-56].

(e) Coping with patients’ unrealistic expectations about cancer treatment [17, 18].

(f) Delivering bad news (about patient’s death; reoccurrence of cancer) [17, 18, 56].

(g) Worrying about a patient outside work [17, 18].

(h) Worries about withdrawal or inappropriate continuation of cancer treatment [17, 18, 42, 54].

(i) Communicating with crying or distressed cancer patients [17, 18, 46, 59].

(k) Death anxiety [48].

For example, up to 58% of oncologists were stressed because of dealing with distressed relatives of dying patients [35, 41]. In addition, between 14% and 43% of oncologists felt stressed because of patient suffering [36, 37, 41, 43, 49] and 78% of paediatric oncologists named caring for a suffering dying child as the most stressful situation for them [53].

4. How many oncologists have depression?

Between 27% of 1740 oncologists [62] and 34% of 334 oncologists [64] suffered from depression as a characteristic of burnout. Other studies showed that between 24% of 407 surgical oncologists [31] and 31% of 549 surgical oncologists [12] had depression, as assessed by the Primary Care Evaluation of Mental Disorders scale. High depression levels were observed among junior oncologists using the same scale: 51% screened positive for depression; 35.2% felt down, depressed or hopeless and 42% felt little interest or pleasure in doing things [63]. Much lower rates of depression (12%) were presented by 155 clinical oncologists (previously known as radiotherapists) and 130 medical oncologists using the
Symptom Checklist for Depression [42]. Another study showed that 5% of 407 surgical oncologists had suicide intentions [31]. The mean score of quality assessment for these studies was 7.5 (moderate).

5. Do oncologists have disrupted sleep?
One study [47] found that of 112 radiation oncologists at resident/young specialist level, 17% complained about having a sleep disorder often. Other studies showed that of 125 surgical oncologists at resident and fellow level, 44% were evaluated as having abnormal sleep scores, with scores of > 9 on the Epworth Sleepiness Scale [63], and 37% of 52 oncologists had sleep disorders [2]. Another study [42] reported that sleep deprivation (measured with one item) among 130 medical oncologists (M=4.3) was significantly higher than that among 155 clinical oncologists (M=3.5). Another study found that 238 medical oncologists felt somewhat stressed because of sleep deprivation, with a mean response of 4.5 on a scale from 0-10 [56]. The mean score of quality assessment for these studies was 7 (moderate).

6. Do oncologists have stress-induced health complaints?
Two studies presented mean scores for oncologists presenting physical symptoms [17, 51] but not norms to enable interpretation. One study found that, of 112 radiation oncologists at resident/young specialist level, 42% said that they often or occasionally had a gastrointestinal/colonic transit illness, 56% had gastric illnesses or gastroesophageal reflux and 37% had irregular heart rhythm [47]. Another study showed that, out of 52 oncologists, 62% reported having headaches, 60% had excessive nervousness, and 48% had an ulcer/gastritis [2]. The mean score of quality assessment for these studies was 7 (moderate).

7. Is alcohol/substance use a problem for oncologists?
One study [32] found that few (8%) of 204 oncology residents drank alcohol ≥4 times a week whereas 20% took hypnotic drugs. Another study found that, of 112 junior radiation oncologists, 10% took alcohol daily and 13% ≥4 times a week whereas only 5% took hypnotic drugs [47]. Another study showed that, of 71 oncology surgeons, 30% used alcohol in a problematic way, defined as having ≥3 drinks on a drinking day (12%) or ≥6 drinks on one occasion (27%) [13]. Another study found that, of 29 gynaecologic oncologists, 41% drank alcohol ≥4 times a week and 10% had received a recommendation to reduce their alcohol intake within the past year [38]. An additional study [12] found that 7% of 549 surgical oncologists were at risk because of their level of alcohol use. The mean score of quality assessment for these articles was 6.8 (moderate).

**CONCLUSIONS**

This review showed that many oncologists have a high level of distress e.g. 32% of oncologists have high emotional exhaustion, 27% have high psychiatric morbidity, between 42 and 69% feel stressed at work, more than 12% of oncologists have depression (with 51% of junior oncologists screening positive), many suffer from sleep deprivation, and stress-induced health complaints such as frequent ulcers, gastric problems, headaches and arrhythmia, up to 30% drink alcohol in a problematic way and up to 20% of junior oncologists use hypnotic drugs. We meta-analysed studies that used identical measurements and therefore draw conclusions about pooled prevalence for burnout and psychiatric morbidity. We predict that the proportion of oncologists in distress will increase in future because rising cancer incidences will increase their workload. For example, there is understaffing in clinical oncology [65, 66] that is rising every year. Recognizing the prevalence of distress in oncology is one step toward accepting that distress is a normal reaction to external
factors such as a higher workload [37, 45, 56]. This review has shown the range of factors that
instigate distress in oncology practice e.g. patient death [17, 18, 42, 43, 53, 54, 56] and
delivering bad news to cancer patients or their relatives [17, 18, 54]. Oncologists struggle
with ‘meaning’ and disappointment about the limits of medicine in treating cancer [17, 18, 42,
54-56] and the high mortality rate from cancer makes oncologists worry about their own death
[48].

It is our hope that recognizing the prevalence of distress will encourage oncologists to confide
in their colleagues and mentors for social support. A Lancet world report about doctors in
distress highlighted the problem of stigmatisation [67] that compels doctors to fear admitting
to their colleagues about being in distress. In some countries, e.g. Australia, this fear is made
worse by mandatory reporting laws that compel other doctors to report a doctor who
confesses distress for professional ‘impairment’ [68]. We argue that this sort of system is
unhelpful in making doctors fearful of being reported or struck off for what is actually a
normal, human reaction to external factors such as working with severely ill or dying patients.
Job-related distress is not a sign of impairment or lack of fitness to practice. The DSM-V
aptly warns against misdiagnosing mental symptoms when there are logical, external causes.
Rather than stigmatizing distress in medical practice, supportive interventions that draw on
peer/mentor support are helpful [69-71].

Future research and limitations

In future research, we recommend that researchers measure distress using published
inventories with good psychometric features (construct/concurrent validity and
internal/external reliability), and using a standardized reporting method. We found the studies
that did meet these criteria beneficial in allowing a meta-analysis. We also call for researchers
in under-represented regions (e.g., Africa, South America, Middle East and Asia) to measure distress among oncologists there because we noticed a striking absence of studies from these regions.

The main limitation of the current systematic review and meta-analysis is that the search covered different sub-specialties of oncology and experience levels, reflected in the observed heterogeneity and inconsistency. However, we were not able to systematically compare junior and senior oncologists because some studies combined data about them whereas other studies provided separate data. The lack of separate subgroup data is one of the main reasons why not many meta-analytic studies perform a subgroup analysis [72]. Even so we believe that this study serves as a good overview of trends in the prevalence of occupational distress among oncologists. We also encourage future researchers to analyse the underlying factors for high inconsistency between studies. Second, the results about stressful situations in oncology practice were limited to those explored by the studies in our search results, which mainly centred on patient care. Future studies about other job stressors in oncology can reveal additional sources of distress.

**CONTRIBUTIONS**

AM and CK devised the research questions. AM conducted the literature searches and analyses under supervision from CK. AM and CK participated in data interpretation and write-up and approved the final version before submission

**CONFLICT OF INTEREST**

No conflict of interest
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Table 1. Publications meta-analysed for prevalence of high burnout and psychiatric morbidity

<table>
<thead>
<tr>
<th>Authors</th>
<th>Country</th>
<th>Count (N)</th>
<th>Results</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arigoni et al., 2009 [29]</td>
<td>Switzerland</td>
<td>113 oncologists</td>
<td>Burnout 27% (30) Psychiatric morbidity 34% (38)</td>
<td>High</td>
</tr>
<tr>
<td>Asai et al., 2007 [30]</td>
<td>Japan</td>
<td>560 oncologists</td>
<td>Burnout 23% (130(^a)) Psychiatric morbidity 21% (118(^a))</td>
<td>High</td>
</tr>
<tr>
<td>Balch et al., 2011 [31]</td>
<td>USA</td>
<td>405 surgical oncologists</td>
<td>Burnout 32% (128)</td>
<td>High</td>
</tr>
<tr>
<td>Berman et al., 2007 [42]</td>
<td>UK</td>
<td>277 medical and clinical oncology specialist registrars</td>
<td>Psychiatric morbidity 29%(^a) (80)</td>
<td>High</td>
</tr>
<tr>
<td>Blanchard et al., 2010 [327]</td>
<td>France</td>
<td>204 residents working with cancer patients</td>
<td>Burnout 26%(^a) (53)</td>
<td>Moderate</td>
</tr>
<tr>
<td>Bragard et al., 2012 [33]</td>
<td>Belgium</td>
<td>113 residents working in cancer care</td>
<td>Burnout 48% (54)</td>
<td>Moderate</td>
</tr>
<tr>
<td>Bressi et al., 2008 [40]</td>
<td>Italy</td>
<td>121 haematoncologists</td>
<td>Burnout 25%(^a) (11) Psychiatric morbidity 14%(^a) (6)</td>
<td>High</td>
</tr>
<tr>
<td>Catt et al., 2005 [16]</td>
<td>UK</td>
<td>44 cancer surgeons and oncologists</td>
<td>Burnout 25%(^a) (11) Psychiatric morbidity 14%(^a) (6)</td>
<td>High</td>
</tr>
<tr>
<td>Elit et al., 2004 [41]</td>
<td>Canada</td>
<td>35 gynaecologic oncologists</td>
<td>Psychiatric morbidity 26% (9(^a))</td>
<td>Moderate</td>
</tr>
<tr>
<td>Glasberg et al., 2007 [34]</td>
<td>Brazil</td>
<td>102 oncologists</td>
<td>Burnout 39% (40)</td>
<td>High</td>
</tr>
<tr>
<td>Guest et al., 2011 [13]</td>
<td>USA</td>
<td>70 surgical oncologists</td>
<td>Burnout 41% (29) Psychiatric morbidity 27% (19)</td>
<td>Moderate</td>
</tr>
<tr>
<td>Kuerer et al., 2007 [12]</td>
<td>USA</td>
<td>519 surgical oncologists</td>
<td>Burnout 24% (125)</td>
<td>High</td>
</tr>
<tr>
<td>Mougalian et al., 2013 [35]</td>
<td>USA</td>
<td>254 medical oncology and haematology/ medical oncology fellows</td>
<td>Burnout 24% (61(^a))</td>
<td>Moderate</td>
</tr>
<tr>
<td>Ramirez et al., 1995 [36]</td>
<td>UK</td>
<td>266 oncologists</td>
<td>Burnout 35%(^a) (94) Psychiatric morbidity 29% (77(^a))</td>
<td>Moderate</td>
</tr>
<tr>
<td>Ramirez et al., 1996 [37]</td>
<td>UK</td>
<td>161 surgical oncologists</td>
<td>Burnout 27% (43(^a))</td>
<td>Moderate</td>
</tr>
<tr>
<td>Shanafelt et al., 2014 [11]</td>
<td>USA</td>
<td>1079 oncologists</td>
<td>Burnout 38% (413)</td>
<td>Moderate</td>
</tr>
<tr>
<td>Stafford et al., 2010 [38]</td>
<td>Australia</td>
<td>28 gynaecologic oncologists</td>
<td>Burnout 36% (10)</td>
<td>Moderate</td>
</tr>
<tr>
<td>Study</td>
<td>Country/Region</td>
<td>Sample Size</td>
<td>Psychiatric Morbidity</td>
<td>Burnout</td>
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<td>--------------------------------------------</td>
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<tr>
<td>Taylor et al., 2005 [42]</td>
<td>UK</td>
<td>708&lt;sup&gt;a&lt;/sup&gt; oncologists</td>
<td>17% (5)</td>
<td>45%&lt;sup&gt;a&lt;/sup&gt; (318)</td>
</tr>
<tr>
<td>Travado et al., 2005 [39]</td>
<td>Italy, Spain, Portugal</td>
<td>121 cancer physicians</td>
<td>35%&lt;sup&gt;a&lt;/sup&gt; (250)</td>
<td>26% (31)</td>
</tr>
<tr>
<td>Tucunduva et al., 2006 [40]</td>
<td>Brazil</td>
<td>129 medical oncologists</td>
<td>34% (44)</td>
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</tr>
</tbody>
</table>

1 Note. <sup>a</sup> Calculated manually for two or more groups of oncologists
### Table 2. Average stress and the proportion of oncologists with high stress

<table>
<thead>
<tr>
<th>Authors</th>
<th>Country</th>
<th>Count</th>
<th>Measurement method</th>
<th>Stress (mean; %)</th>
<th>Conclusion</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andreassen et al., 2013 [45]</td>
<td>Denmark</td>
<td>220 oncologists:</td>
<td>Copenhagen Psychosocial Questionnaire: Stress scale</td>
<td>Overall M=3.2</td>
<td>Oncologists have higher stress on average than stress in general working population (norm for this scale is M=2.3).</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td></td>
<td>76 residents</td>
<td></td>
<td>Residents M=3.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>28 senior resident</td>
<td></td>
<td>Senior resident M=3.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>29 senior registrars</td>
<td></td>
<td>Senior registrars M=3.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>87 consultants</td>
<td></td>
<td>Consultants M=2.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Braggard et al., 2012 [46]</td>
<td>Belgium</td>
<td>113 residents in cancer care</td>
<td>Job Stress Survey</td>
<td>M=83.3</td>
<td>Oncologists have higher stress level compared to stress in general working population (reported median in other studies 59-64).</td>
<td>Moderate</td>
</tr>
<tr>
<td>Bressi et al., 2008 [43]</td>
<td>Italy</td>
<td>121 haemato-oncologists</td>
<td>Proportion with work stress: “stressed by work”</td>
<td>65%</td>
<td>Most oncologists have work stress.</td>
<td>High</td>
</tr>
<tr>
<td>Ciammella et al., 2013 [47]</td>
<td>Italy</td>
<td>112 radiation oncologists (residents and young specialists)</td>
<td>Proportion with work stress: “stressed by work”</td>
<td>69%</td>
<td>Most oncologists have work stress.</td>
<td>Moderate</td>
</tr>
<tr>
<td>Grunfeld et al., 2005 [50]</td>
<td>Canada</td>
<td>97 medical oncologists</td>
<td>Proportion with high stress</td>
<td>46%</td>
<td>Many oncologists have high stress.</td>
<td>Moderate</td>
</tr>
<tr>
<td>Isikhan et al., 2004 [2]</td>
<td>Turkey</td>
<td>52 oncologists</td>
<td>Job Stress Inventory</td>
<td>M=30.53</td>
<td>Oncologists have a ‘dangerous’ level of stress (stress reached dangerous dimension if score is more than 30)</td>
<td>High</td>
</tr>
<tr>
<td>Authors</td>
<td>Country</td>
<td>Participants</td>
<td>Distress</td>
<td>Levels</td>
<td>Findings</td>
<td>Level</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------------------</td>
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<td>--------</td>
<td>--------------------------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Szumacher et al., 2007 [58]</td>
<td>Canada</td>
<td>43 radiation oncology residents</td>
<td>Often feel tired and overworked</td>
<td>Strongly agree</td>
<td>Agree</td>
<td>Often feel stressed out or depressed</td>
</tr>
<tr>
<td>Shanafelt et al., 2005 [56]</td>
<td>USA, Canada and Mexico</td>
<td>238 medical oncologists</td>
<td>Stress level</td>
<td>Internship/residency</td>
<td>Fellowship</td>
<td>Current practice</td>
</tr>
<tr>
<td>Wieslaw et al., 2008 [61]</td>
<td>Denmark</td>
<td>103 junior oncologists</td>
<td>Copenhagen Psychosocial Questionnaire: Stress scale</td>
<td>M=3.6</td>
<td>Oncologists have higher stress on average than stress in general working population (norm for this scale is M=2.3).</td>
<td>Moderate</td>
</tr>
<tr>
<td>White et al., 2010 [609]</td>
<td>USA</td>
<td>104 orthopaedic oncologists</td>
<td>Proportion who feels that emotional stress is important or very important as a significant challenge in their oncology practice.</td>
<td>43%</td>
<td>Many oncologists rate emotional stress as an important challenge in practice.</td>
<td>Low</td>
</tr>
</tbody>
</table>

**Note.** M - mean scores

Footnote: Two publications are excluded from table 3 because the measurement methods used in these publications have no norm score therefore we could make no conclusion about stress proportions and how oncologists compare with other professions. (1) Kash et al. 2000, USA, 102 oncologists and 76 house staff from a cancer center were assessed for stress using the Psychiatric Epidemiology Research Interview (PERI): distress; house staff distress M=30.10, oncologists distress M=21.63. (2) Stewart & Barling, 1996, Canada, 17 cancer physicians were assessed using a measure of subjective work stress devised by the authors, M=97.17.
FIGURES

**Figure 1.** PRISMA flow-diagram

**Figure 2. a.** Forest plot of the prevalence of high burnout among oncologists (upper and lower confidence intervals in brackets) and the publication weights. Across all publications, 32% of oncologists have high burnout (±CI 28% to 36%).

b. Funnel plot showing that there is relative symmetry in the results from different publications about the proportion of oncologists with high burnout.

**Figure 3. a.** Forest plot of the prevalence of high psychiatric morbidity among oncologists (upper and lower confidence intervals in brackets) and the publication weights. Across all publications, 27% of oncologists have high psychiatric morbidity (±CI 23% to 32%).

b. Funnel plot showing that there is asymmetry in the results from different publications about the proportion of oncologists with high psychiatric morbidity.
Figure 1

Records identified through database searching (n = 14705)

Records after duplicates removed (n = 14763)

Records screened (n = 14763)

Records excluded (n = 14100)

Studies included in qualitative synthesis (n = 43)

Studies included in quantitative synthesis (meta-analysis)
  (burnout n=17, psychiatric morbidity n=11)

Full-text articles assessed for eligibility (n = 663)

Full-text articles excluded, with reasons:
  (n = 617): No quantitative data analysis
  No occupational stress
  No oncologists
  Duplicate analysis
  Missing (n = 2)
Prevalence of oncologists in distress: systematic review and meta-analysis

Figure 3 a/b

<table>
<thead>
<tr>
<th>Study</th>
<th>Prev (95% CI)</th>
<th>% Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arians et al. (2009)</td>
<td>0.34 (0.25, 0.43)</td>
<td>9.2</td>
</tr>
<tr>
<td>Aussel et al. (2007)</td>
<td>0.21 (0.18, 0.25)</td>
<td>12.3</td>
</tr>
<tr>
<td>Berrino et al. (2007)</td>
<td>0.29 (0.24, 0.34)</td>
<td>11.3</td>
</tr>
<tr>
<td>Besse et al. (2005)</td>
<td>0.56 (0.28, 0.85)</td>
<td>9.4</td>
</tr>
<tr>
<td>Cane et al. (2005)</td>
<td>0.14 (0.05, 0.26)</td>
<td>6.1</td>
</tr>
<tr>
<td>Elia et al. (2004)</td>
<td>0.20 (0.12, 0.47)</td>
<td>4.4</td>
</tr>
<tr>
<td>Gagne et al. (2011)</td>
<td>0.27 (0.17, 0.38)</td>
<td>7.7</td>
</tr>
<tr>
<td>Ramize et al. (1995)</td>
<td>0.29 (0.24, 0.35)</td>
<td>11.2</td>
</tr>
<tr>
<td>Ramize et al. (1998)</td>
<td>0.22 (0.16, 0.28)</td>
<td>10.1</td>
</tr>
<tr>
<td>Stafffold et al. (2010)</td>
<td>0.17 (0.05, 0.33)</td>
<td>4.8</td>
</tr>
<tr>
<td>Taylor et al. (2005)</td>
<td>0.35 (0.32, 0.39)</td>
<td>12.5</td>
</tr>
<tr>
<td>Overall</td>
<td>0.27 (0.23, 0.32)</td>
<td>100.0</td>
</tr>
</tbody>
</table>
## Supplementary Material: Review of stressful situations in oncology

<table>
<thead>
<tr>
<th>Author</th>
<th>Country</th>
<th>Participants</th>
<th>Results</th>
<th>Quality</th>
</tr>
</thead>
</table>
| Berman et al. (2007) | UK         | 277 specialist registrars: 127 medical oncologists 150 clinical oncologists | Talking with distressed relatives  
  Medical oncology M=6.7 (SD=2.5)  
  Clinical oncology M=6.5 (SD=2.7)  
  Failure of treatment  
  Medical oncology M=6.4 (SD=2.6)  
  Clinical oncology M=5.9 (SD=2.6)  
  Treatment withdrawal  
  Medical oncology M=5.8 (SD=2.5)  
  Clinical oncology M=5.6 (SD=2.4)  
  Dealing with death  
  Medical oncology M=5.8 (SD=2.5)  
  Clinical oncology M=5.5 (SD=2.5) | High     |
| Bragard et al. (2010) | Belgium    | 47 residents working in cancer care                                            | Stress to communicate with cancer patient M=53.6 (SD=18)                                          | High    |
| Bressi et al. (2008) | Italy      | 121 haemat-oncologists                                                        | Work with patients with life-threatening diseases 34%  
  Work with terminally ill patients 46%  
  Losing patients 33%  
  Work with suffering patients 43% | High    |
| Cochrane et al. (1991) | USA        | 81 oncologists: 51 medical oncologists 28 surgical oncologists 2 paediatric oncologists | Medical oncologists M=6.76 (SD=2.91)  
  Surgical oncologists M=6.43(SD=2.81)  
  Paediatric oncologists M=5.5 (SD=3.54) | High    |
<p>| Guest et al. (2011b) | USA        | 70 surgical oncologists                                                       | Stress/burnout related to patients’ suffering and death M=4.36 (SD=2.51) | Moderate |</p>
<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Participants</th>
<th>High 14%</th>
<th>Low 6%</th>
</tr>
</thead>
</table>
| Herschbach (1992)                               | Germany     | 299 oncologists | Informing relatives of a patient's death $M=2.7$  
Giving diagnosis of recurrence $M=3.2$  
Death of several patients at the same time $M=2.5$  
Experiencing protracted illness $M=3.3$  
Death of a patient during my absence $M=2.3$  
Patients dying before my eyes $M=2$  
Crying patients $M=0.8$  
Clinging patients $M=2.4$  
Aggressive patients $M=2.2$  
Being upset by crying patients $M=2.4$  
Patients unrealistic expectations of recovery $M=2.7$  
Patient suffering under doctor’s therapy $M=2.7$  
Inappropriate prolongation of life $M=1.6$  
Withdrawal patients $M=1.6$  
Questioning the point of ones work $M=2.2$  
Disappointment in the powers of medicine $M=1.7$  
Being unsure if have helped the patient $M=2.9$  
Thinking of the children of incurable patients $M=2.5$  
Having to think about patients while falling asleep $M=2.5$ | Moderate |
| Mougalian et al. (2013)                         | USA         | 224 medical oncology or haematology/medical oncology fellows | Dread having to deal with the emotional distress of family members of a patient:  
Generally/completely agree $31\%$ | Moderate |
<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Sample Description</th>
<th>Tasks</th>
<th>Stress Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Papadatou et al. (2002)</td>
<td>Greece</td>
<td>14 paediatric oncologists</td>
<td>Provide support to parents during the terminal period</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Most stressful 0% least stressful 64%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Provide support to parents who grieve over the death of their child</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Most stressful 0% least stressful 64%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Be present at the moment of death</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Most stressful 29% least stressful 21%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Provide care to a dying child who is in a coma</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Most stressful 7% least stressful 43%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Provide care to a child who dies unexpectedly</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Most stressful 64% least stressful 7.1%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Provide care to a dying child you know for a long time</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Most stressful 14% least stressful 21%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Provide care to a dying child whom you do not know</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Most stressful 50% least stressful 21%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Provide care to a dying child who is in pain and is suffering</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Most stressful 79% least stressful 0%</td>
<td></td>
</tr>
<tr>
<td>Ramirez et al. (1995)</td>
<td>UK</td>
<td>266 cancer clinicians: 59 medical oncologists 207 clinical oncologists</td>
<td>Dealing with patient's suffering contributes to the overall stress quite a bit or a lot for Medical oncologists 22% Clinical oncologists 29%</td>
<td>Moderate</td>
</tr>
<tr>
<td>Ramirez et al. (1996)</td>
<td>UK</td>
<td>161 surgical oncologists</td>
<td>Dealing with patient's suffering contributes to the</td>
<td>High</td>
</tr>
<tr>
<td>Study Authors and Year</td>
<td>Country</td>
<td>Sample Size/Notes</td>
<td>Stressors and Scores</td>
<td>Overall Stress Description</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------</td>
<td>-------------------</td>
<td>----------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Sands et al. (2008)</td>
<td>USA</td>
<td>6 paediatric oncologists</td>
<td>The Stressor Scale for Paediatric Oncology Nurses (SSPON) inventory: Knowing What Is Ahead: M=562.5 (SD=174.31) Limits of Care M=696.11 (SD= 135.36) Death Without Grace M=567.92 (SD=260.63) Emotional Demands M=564.05 (SD=206.28)</td>
<td>overall stress quite a bit or a lot for 31%</td>
</tr>
<tr>
<td>Sehlen et al. (2009)</td>
<td>Germany and Austria</td>
<td>82 oncologists</td>
<td>Against conviction patients were kept alive with all resorts M=1.37 (SD=1.62) Patients suffering of doctor’s therapy M=1.93 (SD=2.23) Stress due to patient's disease progression M=2.71 (SD=1.35)</td>
<td></td>
</tr>
<tr>
<td>Shanafelt et al. (2005)</td>
<td>US, Canada and Mexico</td>
<td>238 medical oncologists</td>
<td>Delivering bad news to patients M=5.5 (SD=2.44) Dealing with death/suffering of patients M=5.8 (SD=2.36) Finding meaning in your work M=3.1 (SD=2.84)</td>
<td></td>
</tr>
<tr>
<td>Ullrich &amp; Fitzgerald (1990)</td>
<td>Germany</td>
<td>57 oncologists</td>
<td>Tell relatives of the death of a patient M=2.6 Patient dies in hands M=1.9 Experience with some patients the long-drawn-out advance of the illness M=3.5 Several patients lie dying at the same time M=2.9 A patient whom doctor very much liked dies during his absence M=2.9 Patients are sometimes reproachful because their therapy shows no real signs of success M=2.7 Have to cope with patients</td>
<td></td>
</tr>
</tbody>
</table>
Prevalence of oncologists in distress: systematic review and meta-analysis

<table>
<thead>
<tr>
<th>Reference</th>
<th>Country</th>
<th>Sample Description</th>
<th>Problem Description</th>
<th>Mean Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taylor et al. (2010)</td>
<td>UK</td>
<td>129 colorectal cancer teams: 94 surgeons 35 oncologists</td>
<td>The Hospital Consultants' Job Stress inventory: Dealing with angry or blaming patients/relatives Surgeons M=44 Oncologists M=55 Having distressed patients Surgeons M=31 Oncologists M=28</td>
<td>High</td>
</tr>
<tr>
<td>Taylor et al.</td>
<td>UK</td>
<td>724 oncologists:</td>
<td>Dealing with distressed,</td>
<td>High</td>
</tr>
<tr>
<td>(2005)</td>
<td>287 surgical oncologists</td>
<td>309 clinical oncologists</td>
<td>128 medical oncologists</td>
<td>angry or blaming relatives</td>
</tr>
<tr>
<td>--------</td>
<td>-------------------------</td>
<td>--------------------------</td>
<td>------------------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td></td>
<td>Surgical oncologists 54%</td>
<td>Clinical oncologists 58%</td>
<td>Medical oncologist 42%</td>
<td>Dealing with patients’ suffering</td>
</tr>
<tr>
<td></td>
<td>Surgical oncologists 31%</td>
<td>Clinical oncologists 40%</td>
<td>Medical oncologists 28%</td>
<td></td>
</tr>
</tbody>
</table>

Note. M-mean scores; SD- standard deviation;

*aCalculated manually

Footnote: One publication is excluded from appendix because the measurement methods used in these publications have no norm score therefore we could make no conclusion about anxiety proportions and how oncologists compare with other professions: Meunier et al. 2013, Belgium, 98 residents working in cancer care were assessed for anxiety with State Trait Anxiety Inventory – State form Ya (STAI-Ya)