

# Professional quality of life and burnout amongst radiation oncologists

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## Original Article

# Professional quality of life and burnout amongst radiation oncologists: The impact of alexithymia and empathy



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## ABSTRACT

**Background and purpose:** Different factors may influence the professional quality of life of oncology professionals. Among them, personality traits, as alexithymia and empathy, are underinvestigated. Alexithymia is about deficits in emotion processing and awareness. Empathy is the ability to understand another's 'state of mind'/emotion. The PROject on BurnOut in Radiation Oncology (PRO BONO) assesses professional quality of life, including burnout, in the field of radiation oncology and investigates alexithymia and empathy as contributing factors.

**Material and methods:** An online survey was conducted amongst ESTRO members. Participants completed 3 validated questionnaires for alexithymia, empathy and professional quality of life: (a) Toronto Alexithymia Scale; (b) Interpersonal Reactivity Index; (c) Professional Quality of Life Scale. The present analysis, focusing on radiation/clinical oncologists, evaluates Compassion Satisfaction (CS), Secondary Traumatic Stress (STS) and Burnout and correlates them with alexithymia and empathy (empathic concern, perspective taking and personal distress) with generalized linear modeling. Significant covariates on univariate linear regression analysis were included in the multivariate linear regression model.

**Results:** A total of 825 radiation oncologists completed all questionnaires. A higher level of alexithymia was associated to decreased CS ( $\beta$ :  $-0.101$ ; SE:  $0.018$ ;  $p < 0.001$ ), increased STS ( $\beta$ :  $0.228$ ; SE:  $0.018$ ;  $p < 0.001$ ) and burnout ( $\beta$ :  $0.177$ ; SE:  $0.016$ ;  $p < 0.001$ ). A higher empathic concern was significantly associated to increased CS ( $\beta$ :  $0.1.287$ ; SE:  $0.305$ ;  $p = 0.001$ ), STS ( $\beta$ :  $0.114$ ; SE:  $0.296$ ;  $p < 0.001$ ), with no effect on burnout. Personal distress was associated to decreased CS ( $\beta$ :  $-1.423$ ; SE:  $0.275$ ;  $p < 0.001$ ), increased STS ( $\beta$ :  $1.871$ ; SE:  $0.283$ ;  $p < 0.001$ ) and burnout ( $\beta$ :  $1.504$ ; SE:  $0.245$ ;  $p < 0.001$ ).

**Conclusions:** Alexithymic personality trait increased burnout risk, with less professional satisfaction. Empathic concern was associated to increased stress, without leading to burnout, resulting in higher professional fulfillment. These results may be used to benchmark preventing strategies, such as work-hour restrictions, peer support, debriefing sessions, and leadership initiatives for professionals at risk.

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Radiation oncology is a clinical discipline based on the use of ionizing radiation to treat cancer [1,2]. On a daily basis, oncologists exploit articulated diagnosis, deliver multimodality personalized cancer treatments, supportive care and pain control. They take care of the communicational needs of both patients and caregivers and

are confronted with death and suffering [3]. They also need to face demanding productivity requirements, coping with limited autonomy and increasing regulatory which can lead to ‘administrative fatigue’ [4]. This can substantially affect the professional quality of life, resulting in personal discomfort with different physiological manifestations, including personal fatigue, emotional and cognitive distress, anxiety, depressive symptoms, and, commonly, burnout [5].

Burnout is frequently noticed in working environments having intense involvement with others, such as hospitals. It is prevalent among physicians and, particularly, oncologists [6–10]. It may substantially affect both physician’s well-being and performance at work [7,11,12].

Different inherent factors are associated to burnout, of which coping strategies have been thoroughly explored. Conversely, personality traits involved in emotional regulation, such as alexithymia and empathy, still deserve investigation. Alexithymia conveys a substantial difficulty in identifying, describing and communicating emotions, distinguishing them from bodily sensations, and an externally oriented thinking style [13–15]. Alexithymia is associated with negative affective states, especially depression and anxiety [15]. In addition, alexithymic subjects display difficult interactions with others, including interpersonal ambivalence, poor sociability and the need for social approval [16]. This can potentially affect the performance at work, particularly in the medical profession, leading to a decreased individual satisfaction and increased burnout susceptibility. It is not surprising that alexithymia is linked to deficits in empathy, defined as the ability to share and understand another’s state-of-mind/intention or emotion. In the healthcare environment, effective emphatic communication can enhance the therapeutic effectiveness of the clinician-patient relationship [17].

The correlation between professional quality of life, burnout and different psychological aspects, such as depression, anxiety and coping have already been investigated in oncology professionals [18–20]. Conversely, the relationship with personality constructs is still underinvestigated and deserves attention to fulfill the knowledge gap. The PROject on BurnOut in Radiation Oncology (PRO BONO) assessed the professional quality of life of radiation oncology professionals, including the prevalence of burnout, and explored potential associations with alexithymia and empathy. This could help to implement preventig strategies to reduce the risk of distress within the working environment.

The present report focuses on the population of radiation and clinical oncologists.

## Materials and methods

PRO BONO was developed within the Young European Society for Radiotherapy and Oncology (yESTRO) Committee. An online cross-sectional survey was conducted using Survey Monkey (www.surveymonkey.com). Participants (professionals working in the field of radiation oncology), were invited to participate voluntarily (May–October 2018) via (a) email, after identification as members of ESTRO in its database, (b) social media (Facebook/Twitter) and (c) ESTRO newsletter. The only 2 requirements to be eligible to participate in the survey were to be a radiation oncology professional and member of ESTRO. For the present study, medical doctors with a degree specialization in radiation and/or clinical oncology were selected.

Demographics and professional information useful for stratification were collected.

The survey consisted of four explorative domains. First, *perception of being valued* by patients, patients’ caregivers, colleagues and

supervisor was investigated through direct Yes/No questions (example: “Do you feel valued by your patients?”).

Second, *alexithymia* was assessed using the 20-Item Toronto Alexithymia Scale (TAS-20) [21] with rating ranging from “strongly disagree” to “strongly agree” on a 5-point Likert scale. The TAS-20 provides three subscale scores: “Difficulty Identifying Feelings” (DIF); “Difficulty Describing Feeling” (DDF); and “Externally Oriented Thinking scale” (EOT). The total score (TAS\_Tot) was used to stratify respondents into non-alexithymic (score  $\leq 51$ ), borderline (score: 52–60), and alexithymic (score  $\geq 61$ ) [22].

The scale has shown good internal consistency (Cronbach’s alpha:  $\geq 0.70$ ) and test–retest reliability [23]. In line with these results, in our sample the Cronbach’s alpha was good for the TAS-20 total score ( $\alpha$  score = 0.76).

Third, *empathy* was assessed using the Interpersonal Reactivity Inventory (IRI), employing 28-items on a 5-point Likert scale ranging from “Does not describe me well” to “Describes me very well” [24]. The IRI assesses two affective components referring to the emotional reaction elicited by (1) an agent focusing on the other and (2) self-oriented set of feelings: the Empathic Concern (EC, i.e. the tendency to share the experience of others, with feelings of warmth and compassion), and the Personal Distress (PD, i.e. focusing on one’s own feelings of anxiety and discomfort in reaction to the emotions of others), respectively. Furthermore, the Perspective Taking (PT, i.e. the ability to adopt the point of view of others) and the Fantasy (FS, i.e. the tendency to imagine oneself into the feelings and actions of fictitious situations) subscales assess the cognitive aspects of empathy. The final score of each scale ranges from 0 to 4, with a higher score indicative of a higher degree of empathy (except for the PD subscale where the lecture frame is in the opposite direction).

The scale has shown good internal consistency (Cronbach’s  $\alpha$  range: 0.70–0.78) and test–retest reliability [24]. In line with these results, in our sample the Cronbach’s alpha values were acceptable/very good for the IRI subscales ( $\alpha$  scores range: 0.68–0.83).

Fourth, *professional quality of life* was assessed using the Professional Quality of Life Scale (ProQoL) version 5 consisting of 30 items rated on a 1 (never) to 5 (very often) scale [25]. The ProQoL assesses both the positive (Compassion Satisfaction) and negative (Compassion Fatigue) aspects influencing one’s professional quality of life. The Compassion Satisfaction Scale (CSS) represents the pleasure from being able to perform one’s job well. The Compassion Fatigue (CF) is divided into two scales. The Burnout Scale (BS) concerns feelings of hopelessness, exhaustion, frustration and difficulties in dealing with work or in performing one’s job effectively. The Secondary Traumatic Stress Scale (STSS) concerns negative feelings driven by work-related secondary exposure to excessive or traumatic stressful events (e.g. fear, sleep difficulties, intrusive images). Based on the corresponding percentile scores established in the original ProQoL [25], participants were classified into low (score below the 25th percentile), average (25th–75th percentile), and high (score above the 75th) groups for each scale. The cut-off scores at the 25th percentile were 44 for the CSS, 43 for the BS and 42 for the STSS. The cut-off scores at the 75th percentile were 57 for the CSS, 56 for the BS and the STSS.

The scale has shown good internal consistency (Cronbach’s  $\alpha$  range: 0.72–0.87) and test–retest reliability [25]. In line with these results, in our sample the Cronbach’s alpha values were good for the ProQoL subscales ( $\alpha$  scores range: 0.72–0.84).

## Statistical analyses

For continuous variables, the normal distribution was assessed verifying the values of skewness (Sk) and kurtosis (K). Based on these criteria the assumption of normality was met for all the variables (all the absolute values  $< 1.0$ ). Mean (SD) scores and frequen-

cies were used as descriptive analyses, in case of normal distribution. An independent sample t-test and a Pearson Chi-Square test were used to compare socio-demographical and work-related variables between completers and drop-out participants. A Pearson bivariate ( $r$ ) or point-biserial ( $r_{pb}$ ) correlation was used to analyse the relationship between variables. Three hierarchical multiple regression analyses were used to investigate whether alexithymia, empathy and work-related variables were significant contributing factors for the explanation of the professional QoL, using the three subscales of the ProQoL as outcome variables, namely CSS, STSS and BS. A stepwise method was used for variable inclusion of potentially confounding and competing predictors. To avoid unnecessary reductions in statistical power, confounding (age, gender and marital status) and competing (alexithymia, empathy, and work-related variables) predictor variables were included in the regression models only if significantly correlated with the outcome variables ( $p$ -value < 0.05). Collinearity was assessed using the statistical factors of tolerance and Variance Inflation Factor (VIF). All the analyses were performed with the software "Statistical Package for Social Sciences-version 25" (SPSS-25) (IBM, Armonk, New York)

## Results

Up to 1061 medical doctors participated in the survey from 94 countries with Spain (9.6%), Italy (7.9%), Australia (6.6%), Netherlands (6.6%), Canada (5.7%), Germany (5.1%), Poland (4.9%), Belgium (4.7%) and India (4.7%) as the most represented.

Of the 1061 participants, 828 medical doctors (78%) fully completed the survey, whereas 233 (22%) interrupted the participation before the end (probably deeming the process as excessively time-consuming). The comparison between those who completed and those who did not in terms of socio-demographical and work-related variables shows that drop-out participants were younger, with a statistically significant higher proportion of subjects (14.9% vs. 9.5%) "not feeling valued by patients' caregivers" (Appendix A). All the upcoming analyses were performed on the participants who fully completed the survey (828 subjects). Of these 613 (74%) were radiation and 215 (26%) clinical oncologists.

Participant groups were well balanced between male and female. Mean age was 42 (Table 1). Most had a professional experience  $\leq 10$  years, and the majority declared to feel valued by colleagues and/or patients/caregivers at the workplace. However, for the question: "Do you feel valued by your head/chief/supervisor?" a substantial percentage of participants (29%) declared not feeling valued (Table 1).

Around 13% of oncologists had a TAS-20 score suggesting the presence of alexithymia, while another 22% showed the presence of alexithymic traits at a subclinical borderline level (Table 2). The distribution across the quartiles of the professional ProQoL scores showed an unbalanced distribution for the STSS, with 32.2% medical doctors comprised within the high and 18.2% within the low quartile (Table 2), indicating a high presence of negative symptoms due to exposure to others' traumatic experience.

Hierarchical multiple regression analyses were performed to investigate significant predictors of professional QoL. To avoid unnecessary reduction in statistical power, exploratory Pearson's bivariate correlational analyses were performed to investigate the correlation between independent and dependent (ProQoL) variables (Table 3). In case of statistical significance, age, gender and marital status were inserted into the first regression block, alexithymia into the second block, empathy into the third. Lastly, professional variables (years in the field, on call shifts, perception

**Table 1**

Socio-demographical and work-related variables of the 828 medical doctors who completed the on-line survey.

	Medical Doctors (N = 828)
Age (Mean (SD))	41.8 (10.6)
Gender (N (%))	
Male	393 (47.5%)
Female	435 (52.5%)
Marital Status (N (%))	
Single	153 (18.2%)
Married/Cohabiting	639 (77.9%)
Divorced	31 (3.7%)
Widowed	5 (0.6%)
Year in the field (N (%))	
$\leq 10$	456 (55.1%)
$> 10$	372 (44.9%)
N_shift (N (%))	
No	366 (44.4%)
Yes	462 (55.8%)
V_Patients (N (%))	
No	40 (4.8%)
Yes	788 (95.2%)
V_Caregivers (N (%))	
No	79 (9.5%)
Yes	749 (90.5%)
V_Supervisor (N (%))	
No	238 (28.7%)
Yes	590 (71.3%)
V_Colleagues (N (%))	
No	119 (14.4%)
Yes	709 (85.6%)

N\_Shift: "On call" shift; V\_Patients/Caregivers/Colleagues/Supervisor: perception of being valued by patients, patients' caregivers/colleagues/supervisor.

**Table 2**

Alexithymia, Empathy and Professional QoL among the 828 medical doctors who completed the on-line survey.

	M (SD)	N (%)
Alexithymia		
TAS_Tot	47.4 (10.9)	
Non alexithymic		538 (65%)
Borderline		183 (22.1%)
Alexithymic		107 (12.9%)
TAS_DIF	15.5 (5.6)	
TAS_DDF	12.1 (3.6)	
TAS_EOT	19.8 (3.9)	
Empathy (IRI)		
IRI_PT	2.56 (0.65)	
IRI_FS	2.11 (0.77)	
IRI_EC	2.76 (0.61)	
IRI_PD	1.58 (0.69)	
Professional QoL (ProQoL)		
PQ_CSS	38 (5.9)	
Low		218 (26.3%)
Average		377 (45.5%)
High		233 (28.1%)
PQ_BS	25.6 (5.6)	
Low		208 (25.1%)
Average		364 (44%)
High		256 (30.9%)
PQ_STSS	24.1 (6)	
Low		151 (18.2%)
Average		410 (49.5%)
High		267 (32.2%)

TAS-20: Toronto Alexithymia Scale-20; TAS-20\_DIF: Difficulty identifying feelings subscale; TAS-20\_DDF: Difficulty describing feeling subscale; TAS-20\_EOT: Externally oriented thinking subscale; IRI: Interpersonal Reactivity Index; IRI\_PT: Perspective Taking; IRI\_FS: Fantasy; IRI\_EC: Empathic Concern; IRI\_PD: Personal Distress; PQ\_CSS: Compassion Satisfaction Scale; PQ\_BS: Burnout Scale; PQ\_STSS: Secondary Traumatic Stress Scale. Low and High refer to a score below the 25th percentile or above the 75th percentile, respectively, whereas Average include the intermediate scores.

**Table 3**  
Correlations with the Professional Quality of Life (ProQoL).

	PQ_CSS	PQ_BS	PQ_STSS
Age (r)	0.242**	-0.169**	-0.148**
Gender (r <sub>pb</sub> )	-0.084*	0.027	0.111*
Marital Status* (r <sub>pb</sub> )	0.044	-0.029	-0.026
Years in the Field (r <sub>pb</sub> )	0.239**	-0.153**	-0.109*
Do you do "on call" shifts? (r <sub>pb</sub> )	-0.016	0.068*	-0.039
Do you feel valued by your patients? (r <sub>pb</sub> )	0.246**	-0.183**	-0.091*
Do you feel valued by your patients' caregivers? (r <sub>pb</sub> )	0.305**	-0.236**	-0.110*
Do you feel valued by your supervisors? (r <sub>pb</sub> )	0.279**	-0.350**	-0.191**
Do you feel valued by your colleagues? (r <sub>pb</sub> )	0.259**	-0.281**	-0.178**
TAS-20 (r)	-0.405**	0.524**	0.489**
IRI_PT (r)	0.220**	-0.206**	-0.068
IRI_FS (r)	0.002	0.061	0.186**
IRI_EC (r)	0.173**	-0.107*	0.118*
IRI_PD (r)	-0.295**	0.365**	0.438**

Pearson (r) or point-biserial (r<sub>pb</sub>) correlation has been used as appropriate.

\*p < 0.05; \*\*p < 0.001.

TAS-20: Toronto Alexithymia Scale-20; IRI\_PT: Perspective Taking subscale; IRI\_FS: Fantasy; IRI\_EC: Empathic Concern; IRI\_PD: Personal Distress subscale of the Interpersonal Reactivity Index; PQ\_CSS: Compassion Satisfaction Scale; PQ\_BS: Burnout Scale; PQ\_STSS: Secondary Traumatic Stress Scale of the Professional QoL.

\* Marital status has been dichotomized in Married/Cohabiting or Single/Divorced/Widowed.

of being valued by patients, patients' caregivers, colleagues and supervisor) were inserted into the last block, using a stepwise method.

The full regression analyses are reported in Appendix B–D. The final model regarding the Compassion Satisfaction Scale (Table 4) explained a significant amount (32%) of the ProQoL\_CSS [F(8,819) = 49.1, p < 0.001] variance. The presence of alexithymia (TAS-20: β = -0.186) and a high level of personal distress (IRI\_PD: β = -0.167) negatively affected the professional satisfaction,

whereas feeling valued by patient's caregivers (β = 0.198) and by one's supervisor (β = 0.149) increased its level. Age (β = 0.139), feeling valued by colleagues (β = 0.087) and higher scores on the Empathic Concern (β = 0.134) and Perspective Taking (β = 0.083) domains of IRI significantly increased the level of professional satisfaction.

The final regression model describing the Burnout Scale within the ProQoL (Table 4) explained 39% of the variance. The presence of alexithymia (TAS-20: β = 0.354) and personal distress in reaction to others' emotions (IRI\_PD: β = 0.186) was the strongest contributors for burnout, followed by the "On call" shift (β = 0.075) duty. Feeling valued by one's supervisor (β = -0.207) and by patient's caregivers (β = -0.102) were, conversely, the most protective factors, followed by feeling valued by colleagues (β = -0.081) and the perspective taking empathic ability (IRI\_PT: β = -0.073).

A similar pattern of results was found in the final regression model regarding the Secondary Traumatic Stress Scale of the ProQoL (Table 4), with alexithymia (TAS-20: β = 0.415) and Personal Distress (IRI\_PD: β = 0.216) as the strongest negative contributors. A higher level of empathic concern (IRI\_EC: β = 0.114) and fantasy (IRI\_FS: β = 0.11), and female gender (β = 0.003) were also significantly correlated to a higher level of Secondary Traumatic Stress symptoms. Differently from the previous regression models, the work-related variables had a lower impact on this variable, with "Feeling valued by your supervisor" (β = -0.073) as the only factor that significantly reduced the STSS score.

**Discussion**

PRO BONO represents the first study investigating the relation between alexithymia, empathy and professional quality of life including burnout in radiation oncology professionals. The present work explores, on a cross-sectional design, the situation amongst radiation and clinical oncologists, providing data on more than

**Table 4**  
Final models of the hierarchical multiple linear regression on the Compassion Satisfaction (PQ\_CSS), Burnout (PQ\_BS) and Secondary Traumatic Stress (PQ\_STSS) Scales of the ProQoL.

	Predictor	R <sup>2</sup>	Adj R <sup>2</sup>	F	B	SE B	β	P
<b>PQ_CSS</b>		0.324	0.318	49.11*				
	Age				0.077	0.016	0.139	<0.001
	TAS-20				-0.101	0.018	-0.186	<0.001
	IRI_PD				-1.423	0.275	-0.167	<0.001
	IRI_EC				1.287	0.305	0.134	<0.001
	IRI_PT				0.754	0.293	0.083	0.01
	V_Caregivers				3.973	0.604	0.198	<0.001
	V_Supervisor				1.935	0.405	0.149	<0.001
V_Colleagues				1.464	0.524	0.087	0.005	
<b>PQ_BS</b>		0.395	0.389	60.73*				
	Age				-0.021	0.015	-0.04	0.153
	TAS-20				0.177	0.016	0.345	<0.001
	IRI_PD				1.504	0.245	0.186	<0.001
	IRI_PT				-0.63	0.246	-0.073	0.011
	V_Supervisor				-2.557	0.364	-0.207	<0.001
	V_Caregivers				-1.947	0.544	-0.102	<0.001
	V_Colleagues				-1.297	0.473	-0.081	0.006
N_Shift				0.849	0.311	0.075	0.006	
<b>PQ_STSS</b>		0.352	0.347	63.68*				
	Age				0.002	0.017	0.003	0.908
	Gender				0.839	0.351	0.07	0.017
	TAS-20				0.228	0.018	0.415	<0.001
	IRI_PD				1.871	0.283	0.216	<0.001
	IRI_EC				1.114	0.296	0.114	<0.001
	IRI_FS				0.86	0.242	0.11	<0.001
	V_Supervisor				-0.966	0.383	-0.073	0.012

\*p < 0.001.

TAS-20: Toronto Alexithymia Scale-20; IRI\_PT: Perspective Taking subscale; IRI\_FS: Fantasy; IRI\_EC: Empathic Concern; IRI\_PD: Personal Distress subscale of the Interpersonal Reactivity Index; V\_Caregivers/Colleagues/Supervisor: perception of being valued by patients' caregivers/ colleagues/supervisor; N\_Shift: "On call" shift.

800 professionals from 94 countries. Since the working conditions may consistently affect the performance of healthcare providers, the psycho-social working environment of radiation oncology professionals deserves attention, particularly to decrease the level of stress and the likelihood to develop burnout [26].

In the 11th Revision of the International Classification of Diseases (ICD-11), burnout was classified as an occupational phenomenon and not as a medical condition [27]. The World Health Organization defines it as a “syndrome conceptualized as resulting from chronic workplace stress that has not been successfully managed” [27]. It is characterized by three dimensions: (1) emotional exhaustion (feeling emotionally overextended and exhausted with loss of enthusiasm for professional life), (2) depersonalization (having unfeeling and impersonal relationships, with a tendency to cynicism) and (3) low sense of accomplishment (sense of inadequacy in one’s achievements, with loss of perspective that work is meaningful) [6]. Compared to the general population workforce, physicians are at a higher risk of burnout as they are twice as likely to have burnout and feel less satisfied in terms of work-life balance [28]. Burnout amongst healthcare professionals may have substantial consequences. The American College of Radiology noted that burnout can adversely affect ‘professionalism, academic and clinical performance’ together with ‘patient safety, interpersonal relationships, personnel retention and patient satisfaction’, potentially leading to medical errors and adverse events, as absenteeism from work, staff conflicts, poor prescribing habits, low patient satisfaction and adherence to clinical recommendations, problematic alcohol consumption, disruptive behaviour and early retirement’ [29]. Radiation oncologists work in an intense patient-centered environment, highly demanding in terms of clinical competence, technical proficiency, multidisciplinary attitude, collaboration, communication, health advocacy, managing and administrative tasks [30]. These factors are potential stressors and may influence the likelihood for burnout and the degree of job satisfaction [30].

In our report, up to 30.9% of respondents scored above the 75th percentile in the burnout scale, comparably to previous estimates [31–37]. Burnout point prevalence depends on the assessment tool employed, most commonly the Maslach Burn-out Inventory scale, and on the definition investigators rely on to quantify burnout [3]. A meta-analysis investigating burnout in oncology providers reported average rates of emotional exhaustion of 32% [31]. The prevalence among medical oncologists was reported to be 45% in the United States and as high as 71% (considering emotional exhaustion and/or depersonalization in the definition of burnout) amongst young medical oncologists [3,32]. The estimates for surgical oncologists were around 36% [33]. Data for radiation oncologists are of a similar magnitude, ranging from 20.6% to 44% [7,30,34]. Interestingly, this issue seems to be transversal in radiation oncology, involving professionals in all steps of their career, as shown in the United States, with estimates around 30% for radiation oncology chairpersons, residency program directors and residents [35–37].

In our study, we evaluated professional quality of life amongst radiation oncologists and burnout as one of the 3 domains pertinent to the well-being at work. In this sense we used the ProQoL version 5, based on the Compassion Satisfaction and Compassion Fatigue theory, evaluating both the positive and negative aspects of the profession for those acting as ‘helper’ for suffering individuals [25]. The ProQoL gives a comprehensive evaluation of the emotional content related to work, catching the interaction between personal, working and patient environments and the emotional well-being of the professional. Interestingly, 28.1% of respondents had a high score on the ProQoL Compassion Satisfaction domain, which is about the pleasure one derives from being able to exploit work. This can be an indirect measure of job satisfaction, highlighting the rewarding character of radiation oncology as a profession.

In our study, up to 12.9% showed alexithymia as per TAS-20, while 22.1% showed a subclinical alexithymic trait. This is in line with alexithymia prevalence observed in the general population, which is around 10–13% [15,16,38]. Regarding the associations between alexithymia and ProQoL, the final regression model showed a significant effect of alexithymia on burnout, i.e. radiation oncologists scoring high on alexithymia were more likely to develop burnout. This is interesting since “alexithymic personalities” have cognitive functioning exploited via abstract reasoning, relative language and deficit in symbolisation [39]. Considering the demanding clinical situations that a radiation oncologist faces at work, it is understandable that alexithymic subjects may have a suboptimal interaction with the patient and colleagues, leading to delusion and frustration during daily practice and finally burnout.

The path towards burnout may run through Secondary Traumatic Stress, which was significantly predicted by alexithymia. Secondary Traumatic Stress, observed when one is exposed to others traumatic events as a result of the profession, is usually rapid in onset and normally associated to a specific event. It is reversible in case of effective coping [25]. Alexithymic subjects may have ineffective coping strategies and lower compensation resources to face Secondary Traumatic Stress, leading to chronic compassion fatigue and eventual burnout. The negative effect of alexithymia on job satisfaction is suggested by its negative correlation with Compassion Satisfaction, with radiation oncologists scoring higher in alexithymia showing lower levels of professional satisfaction. This is in-line with data coming from Australia/New Zealand where low satisfaction in delivery of services was significantly associated to feelings of depersonalization [30].

The relation between high scores within IRI-Personal Distress scale and high scores on Secondary Traumatic Stress and Burnout scales and low scores in Compassion Satisfaction scale may be partially due to its relation to alexithymia, since the two variables may co-segregate. On the other hand, this finding may most likely mirror the perturbation on radiation oncologist emotional sphere due to clinical duties and exposure to patient’s sufferings, which may lead to emotional trauma with lower professional satisfaction and a higher burnout probability.

Regarding empathy, a higher score on the Empathic Concern scale increases the likelihood to experience Secondary Traumatic Stress but not Burnout. Also, Empathic Concern as well as Perspective Taking are positive predictors of compassion satisfaction, i.e. the pleasure of being able of doing his/her own work properly. These results highlight that even if empathy can be associated to STS, sensitizing professionals to work-related stressful events, it does not necessarily lead to burnout, but, conversely, is a positive predictor of job satisfaction. Empathic abilities can be considered reliable predictors of professional quality of life, as opposed to alexithymia. Indeed an inability to interpret one’s own internal affective states is strongly associated to difficulties empathizing with others’ feelings [40]. Another interesting finding is the personal relationship between the professional and his/her head/chief/supervisor. Feeling valued by the supervisor was correlated to high scores in Compassion Satisfaction and a decreased likelihood for both Secondary Traumatic Stress and Burnout. This confirms the Compassion Fatigue/Compassion Satisfaction theoretical model outlining the influence of working environment on the quality of professional life [25].

Some biases in our study included its cross-sectional nature which did not allow to establish a causal relationship between burnout and personality traits or respondents’ characteristics. As in most studies reporting on burnout, the standardized questionnaires we used relied on self-reporting, known to be potentially misaligned with reality and leading to potential response bias. In this sense, performance-based instruments or structured interviews, less influenced by the individuals’ awareness, are

considered more reliable options in addition to traditional self-reported measures. Moreover, our analysis, focusing on a specific professional population misses the mutual influence of the dynamics with other professionals on the well-being of radiation oncologists. Another limitation could be that other factors potentially contributing to the level of distress at work were not explored. Among them we can cite individual distress at a personal level, anxiety, depression and consumption of antidepressant and/or anxiolytic [18].

Nevertheless, the PRO BONO study demonstrated the correlation between personality traits, professional quality of life and burnout, allowing to identify alexithymia as a potential risk factor for distress at work amongst radiation/clinical oncologists.

This finding may prompt hospital management, administration and department chiefs to intervene to reduce the burnout risk for predisposed subjects, with work-hour restrictions, debriefing sessions, peer support and leadership initiatives.

Different mitigation strategies have already been proposed. Some of them include organization-directed interventions and involve initiative for task restructuring, work evaluation and supervision, management support, communication training and counselling [41,42]. Others are individual-directed interventions and comprises programs to enhance job competencies, improve coping skills and resilience and train in managing negative emotions [43,44].

The aforementioned initiative can be definitely implemented at the local and institutional level. Nevertheless, it is important to highlight the potential role of national and international radiation oncology societies, such as ESTRO, in fostering measures and interventions to reduce burnout, improve well-being and support oncology professionals.

## Conflict of interest

The authors disclose no conflict of interest.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.radonc.2020.05.017>.

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