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ORIGINAL ARTICLE

Burnout prevalence among European physicians: a systematic review and meta-analysis

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Abstract

Purpose Our objective was to assess burnout prevalence rates among physicians practicing in Europe (regardless of their specialty) taking into account the main approaches used to define burnout with the Maslach Burnout Inventory (MBI) tool.

Methods A systematic review was carried out from 2006 to 2018. A keyword request was obtained using the PubMed/Medline, Web of Science and *Banque de Données en Santé Publique* search engine. Studies written in English measuring burnout with the MBI tool among a population of practicing European physicians were selected. Data were extracted and classified according to burnout's definition provided by the authors. Three definitions using the MBI dimensions were considered: tri-, bi- and unidimensional definition. A meta-analysis was then performed on burnout prevalence rates according to the dimensional definition of burnout.

Results From 2378 search results, we selected 56 studies including from up to 41 European countries. Depending upon the study, physicians' burnout prevalence rates ranged from 2.5% to 72.0%. The pooled prevalence rate of burnout was estimated at 7.7% [5.3–10.4%] with the tridimensional definition, 19.7% [13.5–26.3%] with the bidimensional definition and 43.2% [29.0–57.6%] with the unidimensional definition.

Conclusion Burnout pooled prevalence among physicians varies from single to fivefold depending on the method employed to assess burnout with the MBI tool. Medical community should determine a standardized method to assess burnout prevalence rates to best evaluate this phenomenon.

Keywords Burnout · Physicians · Europe · Meta-analysis · Maslach Burnout Inventory

Introduction

Burnout is an occupational phenomenon revealing the breaking of balance between an individual and his work environment. Initially defined as a "state of vital exhaustion" by the World Health Organization (WHO) in the 10th revision of the International Classification of Diseases (ICD) ("World Health Organization. International Classification of Diseases 10th Revision 2016,"), burnout is since 2019 characterized in the 11th ICD revision as a "syndrome conceptualized as resulting from chronic workplace stress that has not been successfully managed", and characterized by three dimensions ("WHO|Burn-out an 'occupational phenomenon 2019,'"), similar to the three dimensions of the Maslach Burnout Inventory (MBI).

The MBI is a research tool elaborated in 1981 by Maslach and Jackson (1981), which has now become the "gold standard" (Maslach et al. 2008) tool to assess this phenomenon among the multiple tools available for burnout assessment (Halbesleben and Demerouti 2005; Kristensen et al. 2005; Lundgren-Nilsson et al. 2012). The MBI assesses burnout according to three dimensions: emotional exhaustion (EE), depersonalization (DP) and lack of personal accomplishment (PA) (Maslach et al. 2019). The EE dimension is presented as a loss of energy, a feeling of depletion or fatigue. The DP dimension, also referred as cynicism is rather interpreted as a detachment from the job with loss of idealism and withdrawal effect. The PA dimension is described as a lack of professional efficacy leading to productivity decrease and inability to cope (Leiter and Maslach 2016). Although very

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often employed, there is still no established consensus neither on which tool to employ for burnout assessment nor on how to define burnout with the MBI tool; reason why evaluation and comparison of burnout prevalence rates are currently seemed as hazardous. This point has been well exposed by Doulougeri et al. (2016) in 2016 who found that among authors using the MBI, there were five main approaches to define burnout. In a systematic and worldwide review from 2018 conducted by Rotenstein and al. (2018), 47 different burnout definitions were identified among studies assessing burnout with the MBI tool. It appears that some authors use a multidimensional definition: for the more conservative one, also sometimes referred to as "severe burnout" (Brøndt et al. 2008; Kansoun et al. 2019), there is an association of high EE, high DP and low PA. For some others the association of scores outside standards in at least two dimensions is sufficient to define burnout in a multidimensional approach. Other authors use a unidimensional approach by defining burnout as one dimension scoring outside standards. Among the unidimensional definitions, some authors consider a high score in any of the three dimensions, while others only consider a high score in the EE dimension. In 2016, Leiter and Maslach (2016) identified five latent profile of burnout, each considering burnout three dimensions in different scoring patterns: Burnout, Disengaged, Overextended, Ineffective and Engagement. Burnout and Engagement were presented as end-point profiles, scoring high and low, respectively, in all three MBI dimensions. The three other profiles, presented as intermediate, displayed a pattern of scoring high in one specific dimension (DP for Disengaged profile, EE for Overextended profile, and PA for Ineffective profile).

In 2006, the literature linked burnout with quality of work life (Martel and Dupuis 2006) and showed a suicide increase among the medical professionals that was associated with the degradation of some dimensions of quality of work life (Tyssen 2007). The suicide rate among physicians is actually higher than in the general population (Schernhammer and Colditz 2004) and burnout seems to be associated with an increased risk of suicide (Dyrbye and Shanafelt 2016; Sigsbee and Bernat 2014). The association of burnout with medical errors and with quality of patient care is also now investigated (Dewa et al. 2017; Kwah et al. 2016; Loerbroks et al. 2017; Sulaiman et al. 2017).

To our knowledge, over the past 10 years, 12 reviews (Back et al. 2014; Bragard et al. 2015; Dewa et al. 2014, 2017; Embriaco et al. 2007b; Gazelle et al. 2015; Kansoun et al. 2019; Pulcrano et al. 2016; Rama-Maceiras et al. 2015; Romani and Ashkar 2014; Rotenstein et al. 2018; Williams et al. 2015) identified studies on physicians' burnout but ten (Back et al. 2014; Bragard et al. 2015; Dewa et al. 2014, 2017; Embriaco et al. 2007b; Gazelle et al. 2015; Pulcrano et al. 2016; Rama-Maceiras et al. 2015; Romani and Ashkar 2014; Williams et al. 2015) did not take into account the author's definition used to assess burnout prevalence and did not try for a meta-analysis. One review (Kansoun et al. 2019) took this notion into account and conducted a meta-analysis which was performed on physicians from one country. In another review (Rotenstein et al. 2018), a meta-analysis was performed without synthetic classification and was considered non reliable because of the lack of homogeneity in burnout definition and assessment method. In this context, the realisation of a meta-analysis on burnout prevalence among physicians from a wide but still restrained geographical area appears interesting enough to be intended.

In the present study, the objective was to estimate the prevalence rates of burnout among physicians practicing in Europe (regardless of their specialty), taking into account the main approaches used to define burnout with the MBI dimensions.

Methods

Search strategy

The Preferred Reporting Items for Systemic Reviews and Meta-Analysis (PRISMA) guidelines (Moher et al. 2015) and the Meta-analyses Of Observational Studies in Epidemiology (MOOSE) checklist (Stroup et al. 2000) were used to accomplish the study.

The keywords "Burnout, professional" and "Physicians" were used for the systematic search conducted through MEDLINE/PubMed, Web of Science and *Banque de Données en Santé Publique* (BDSP); using Mesh terms (Knecht et al. 1998) for the Pubmed search: "Burnout, professional" [Mesh] AND "Physicians" [Majr]. The study selection period was January 2006 to December 2018.

Study selection process

A first selection of articles was made by two independent readers on the basis of titles and abstracts to include original epidemiological studies. Some additional records, identified through reference list search were added to the selection of screened records. Articles written in English, studying a population of practicing physicians (regardless of their specialty) in a European country (according to the European Council classification ("Council of Europe—47 Member States," 2019), minus Turkey and Russia) were selected. When not available, or not focused on burnout evaluation, papers were not selected. The eligibility of the articles was assessed after the manuscripts were read by both readers. In case of disagreement, a third, independent reader intervened. Articles were included if they reported their definition of burnout and results for burnout prevalence assessed with the

MBI tool and/or prevalence rate for each burnout dimension. Studies only presenting Mean Score in their results were excluded.

Burnout assessment tool

Two versions of the MBI research tool are used to assess burnout among physicians' population: the MBI General Survey (MBI-GS) and the MBI Human Services Survey (MBI-HSS) (Maslach et al. 2019). The MBI-HSS, the original version of the survey, is a 22-item questionnaire suitable for the evaluation of burnout among human services workers such as healthcare workers, while the MBI-GS is a 16-item questionnaire developed for workers of non-human services occupations. They both evaluate burnout by asking on a seven-point Likert scale how often the individual experiences feelings of burnout at work.

With the MBI-HSS, a score is calculated in each dimension by adding the correspondent scale points: scores range from 0 to 54 in the EE dimension, 0–30 in the DP dimension and 0–48 in the PA dimension. With the MBI-GS, scores lead to the calculation of mean scores ranging from 0 to 6 in each dimension. The three dimensions are named differently with this questionnaire but are equally employed (exhaustion for EE, cynicism for DP and professional efficacy for PA).

For both questionnaires, the individual is then classified in high, moderate or low risk of EE, DP and PA, according to predetermined cutoff scores. A high score in the EE and DP dimension is a trend towards burnout, while a low score in the PA dimension is a trend towards burnout.

Data extraction and analysis

The information transcribed in each article was extracted by a reader, reported on an Excel table and then checked by a second reader. Disagreements were resolved by consensus by a third reader. Data was obtained using a systematic analysis grid including: first author, author's burnout definition, year of publication, year of survey, country, physician population's speciality, number of respondents, burnout prevalence rate and percent of population scoring high in the EE and DP dimensions and scoring low in the PA dimension.

The selected studies were classified according to the dimensional definition of burnout provided by the authors. The association of high EE plus high DP and low PA defines the tridimensional approach. The association of at least high EE plus high DP, or high EE plus low PA, or high DP plus low PA stand for the bidimensional approach. When at least one dimension is affected with a high score in the EE or in the DP dimension or a low score in the PA dimension, we consider burnout definition as unidimensional (a distinction has been made in our classification between studies considering any of the three dimensions and studies considering only the EE dimension; their data was, however, analysed without distinction). Meta-analysis was then performed on data of each of the three categories of definition. In a second time, meta-analysis was performed on EE, DP and PA dimension separately (see Supplement).

No difference in classification and analysis has been made between studies measuring burnout with the MBI-GS and those using the MBI-HSS. For studies including physicians and paramedical staff (Chiron et al. 2010; Marques et al. 2018; Renzi et al. 2012; Sharma et al. 2008a; Vandenbroeck et al. 2017; Yuguero et al. 2017), only physicians' results were extracted and presented (if no distinction was made, the study was excluded). Three (Győrffy et al. 2016; Houkes et al. 2011, 2008) studies were conducted at a two time period: both of their results were presented and analysed.

After data extraction, prevalence rates and their 95% confidence intervals (CI) were transformed using the Freeman–Tukey double arcsine transformation to overcome the variance instability (Miller 1978). The study weights were calculated using the inverse variance heterogeneity model (this is a fixed effect model with a quasi-likelihood-based variance structure, favouring the pooled prevalence estimation with a better coverage probability, and a lower observed variance than fixed and random models) (Doi et al. 2015).

Articles quality has been rated using the modified and adapted version of the New Castle–Ottawa scale (Herzog et al. 2013) (see Supplement, eTable 1). Studies' heterogeneity was determined with the Cochran's Q test and the I^2 value (Higgins et al. 2003). The I^2 describes the percentage of total variation across studies, which is due to heterogeneity rather than chance. To consider publication bias, the Luis Furuya–Kanamori (LFK) index was used as a measure of Dot plot asymmetry [LFK index within ± 2: minor asymmetry, if it exceeds ± 2: major asymmetry (giving reason to suspect publication bias)] (Furuya-Kanamori et al. 2018).

A sensitivity analysis was conducted to assess the impact of excluding one study on the pooled prevalence estimates. A study was considered as influential if the pooled prevalence in the 95% confidence interval estimate of the full-set studies did not include the pooled prevalence estimate without the excluded study. Analyses were performed with MetaXL© (version 5.3).

Results

Studies characteristics

The systematic search on the three databases identified 2372 records. Another six articles were added after identification through references of selected studies (Fig. 1). To meet selection criteria, 2159 were excluded. Finally, 219 articles regarding European physicians' burnout were selected,

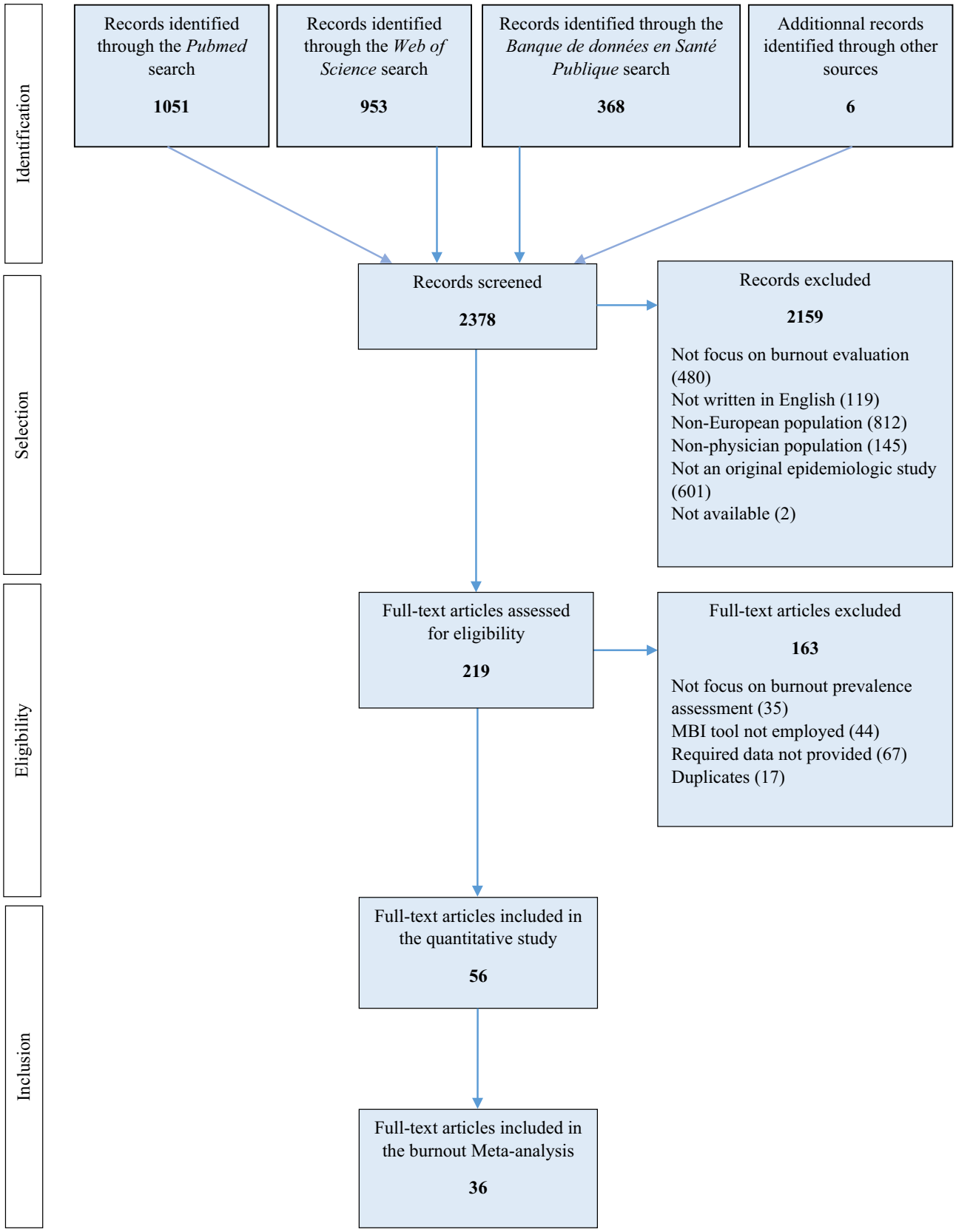

Fig. 1 Flow chart of excluded and included studies

of which 56 articles provided the required information for both meta-analyses: meta-analysis of burnout (36 studies) and meta-analysis of each dimension separately (50 studies). Among those 56 articles, 28 studies reported burnout definition as tridimensional, 8 as bidimensional and 21 as unidimensional. One study (Brøndt et al. 2008) was presented twice as it provided results for two different burnout definitions (each of this data has been analysed in the appropriate category).

Characteristics of the population and prevalence data are presented in Table 1. Publication period was 2006–2018 and surveys' conduction period was 2002–2017. The 56 studies presented results in a population of practicing physicians whose sample size ranged from 29 to 4784 participants. Seventeen articles (Arigoni et al. 2009; Eelen et al. 2014; Fischer Pedersen et al. 2016; Garelick et al. 2007; Győrffy et al. 2018, 2016; Marques et al. 2018; Meerten et al. 2014; Putnik and Houkes 2011; Renzi et al. 2012; Rø et al. 2007; Soler et al. 2008; Stanetic and Tesanovic 2013; Stojanovic-Tasic et al. 2018; Sulaiman et al. 2017; Tijdink et al. 2014; Vandenbroeck et al. 2017) studied physicians regardless of their medical specialty, while the 39 others studied one or two specific specialties. General practice, the most frequent specialty included, accounted for 10 articles (Brøndt et al. 2008; Fischer Pedersen et al. 2018; Houkes et al. 2011, 2008; O'Dea et al. 2017; Ožvačić Adžić et al. 2013; Torppa et al. 2015; Twellaar et al. 2008; Vicentic et al. 2013; Yuguero et al. 2017).

Meta-analysis results are presented in Fig. 2.

Burnout pooled prevalence when considering the tridimensional definition

Fifteen studies reported burnout for 779 subjects out of 9564. The burnout pooled prevalence estimate was 7.7% [5.3–10.4%]. The highest prevalence rate of burnout (19.4%) was reported for general practitioners in a survey conducted in 2002 in The Netherlands (Twellaar et al. 2008). The lowest rate (2.5%) was reported for intensive care physicians in France during a survey conducting period from 2009 to 2011 (Garrouste-Orgeas et al. 2015).

Burnout pooled prevalence when considering the bidimensional definition

Eight studies, reported burnout for 535 physicians out of 2647. Burnout pooled prevalence estimate was 19.7% [13.5–26.3%]. The highest prevalence rate (28.9%) reported by two studies concerned urologists from United Kingdom and Ireland (O'Kelly et al. 2016) and otorhinolaryngologists–surgeons from United Kingdom (Vijendren et al. 2018), both surveyed in 2014. The lowest rate (8.0%) was reported for French emergency physicians (Truchot et al. 2018).

Burnout pooled prevalence when considering the unidimensional definition

Nine studies reported burnout for 1836 physicians out of 4161. The pooled prevalence rate of burnout was 43.2% [29.0–57.6%]. The highest prevalence rate (72.0%) was reported for emergency physicians from Germany (Weigl and Schneider 2017). The lowest rate (14.5%) was reported for German haematologists and oncologists (Nitzsche et al. 2017).

Burnout pooled prevalence of high EE, high DP and low PA (e-Fig. 1, 2 and 3)

Results are presented and discussed in Supplement.

Heterogeneity, asymmetry and sensitivity tests (e-Figs. 4–9)

The heterogeneity Q-test evaluation was found to be significant ($p < 0{,}001$) for each of the three burnout definitions categories analysed. Their three I^2-values indicate there is a substantial heterogeneity: about 93% of the observed variance in the effects is true in the tri- and bidimensional definitions categories and 98% in the unidimensional one. The LFK index indicates there is no asymmetry in the Dot plot for the three categories (tridimensional: LFK = 0.62; bidimensional: LFK = 0.26 and unidimensional: LFK = − 0.89). Regarding sensitivity analysis results, the effect of excluding one study at a time from the analysis of pooled prevalence rates was examined: no study included in the meta-analysis had a significant effect.

Discussion

Critiques of the study

Some limitations are to be noted. Using one assessment tool makes the selected articles gain in homogeneity. Some adapted and validated versions of the MBI questionnaire exist and have been employed by authors (translated versions, adapted cutoff scores according to populations, etc.) with no certain effect on heterogeneity: either by reducing population-linked heterogeneity, or by creating some methodological one. By not taking into account these adaptations of the MBI questionnaire eventually made by the authors, and by analysing indistinctly data collected with the MBI-HSS and MBI-GS, there remains some heterogeneity among the selected studies. In addition, the MBI is a self-referred

Table 1 Prevalence of Overall Burnout and MBI-GS/HSS dimensions in 56 European studies

Year of publication	Sources (references)	Year of survey	Country	Sample size (*N*)	Specialty	Prevalence *N* (%)			
						High EE	High DP	Low PA	Overall burnout
Burnout definition = tridimensional definition									
2018	Riquelme et al. (2018)	2015	Spain	301	Pain medecine	68 (22,6)	67 (22,3)	75 (24,9)	22 (7,3)
2018	Sanfilippo et al. (2018)	2017	Italy	382	Cardiac anaesthesiology	54 (14,1)	93 (24,4)	140 (36,7)	–
2018	Stojanović-Tasić et al. (2018)	2016	Serbia	210	Multiple	68 (32,4)	31 (14,9)	35 (16,7)	–
2017	Jesse et al. (2017)	–	8 European countries	108	Transplant surgery	33 (30,6)	19 (17,6)	29 (26,9)	–
2017	O'Dea et al. (2017)	–	Ireland	683	General practice	360 (52,7)	216 (31,6)	111 (16,3)	45 (6,6)
2017	Vanderbroeck et al. (2017)	2012	Belgium	1169	Multiple	452 (39,0)	317 (27,0)	176 (15,0)	60 (5,0)
2017	Yuguero et al. (2017)	2014	Spain	136	General practice	39 (28,7)	25 (18,4)	15 (11,0)	9 (6,6)
2016	Ficsher Pedersen et al. (2016)	2014	Denmark	1841	Multiple	307 (16,7)	288 (15,6)	533 (29,0)	93 (5,1)
2016	Győrffy et al. (2016)	2003 2013	Hungary	408 2414	Multiple (only women)	80 (19,6) 507 (21,0)	46 (11,2) 338 (14,0)	63 (15,5) 929 (38,5)	– –
2016	Milenović et al. (2016)	2013	Serbia	205	Anaesthesiology	108 (52,7)	25 (12,2)	59 (28,8)	13 (6,3)
2016	Pranckeviciene et al. (2016)	2015	Lithuania	31	Neurosurgery	8 (26,0)	5 (16,0)	8 (26,0)	–
2015	Garrouste-Orgeas et al. (2015)	2009–2011	France	330	Intensive care	35 (10,6)	81 (24,5)	104 (31,5)	8 (2,5)
2014	López-Lería et al. (2014)	–	Spain	240	Embryology	74 (29,7)	63 (25,3)	84 (33,7)	7 (2,90)
2013	Lesage et al. (2013)	2011	France	1440	Occupational health	494 (34,3)	289 (20,1)	920 (63,9)	170 (11,8)
2013	Ožvačić Adžić et al. (2013)	–	Croatia	125	General practice	53 (42,4)	20 (16,0)	19 (15,2)	–
2013	Stanetić et Tešanović (2013)	2010	Bosnia Herzegovina	239	Multiple	110 (46,0)	51 (21,3)	103 (43,1)	–
2011	Putnik et al. (2011)	2008	Serbia	373	Multiple	180 (48,0)	48 (12,9)	19 (5,1)	–
2010	Chiron et al. (2010)	2006	France	74	Anaesthesiology	12 (16,2)	13 (17,6)	10 (13,5)	–
2009	Arigoni et al. (2009)	–	Switzerland	371	Multiple	123 (33,0)	102 (28,0)	72 (20,0)	22 (6,0)
2009	Bressi et al. (2009)	2007	Italy	81	Psychiatry	40 (49,0)	32 (39,0)	18 (22,0)	–
2008	Brøndt et al. (2008)*	2004	Denmark	379	General practice	–	–	–	10 (2,8)
2008	Houkes et al. (2008)	2002 2004	The Netherlands	261	General practice	66 (25,4) 35 (13,5)	102 (39,2) 63 (24,2)	13 (5,0) 10 (3,8)	– –

Table 1 (continued)

Year of publication	Sources (references)	Year of survey	Country	Sample size (*N*)	Specialty	Prevalence *N* (%)			
						High EE	High DP	Low PA	Overall burnout
2008	Sharma et al. (2008b)	2005	United Kingdom	501	Colorectal and vascular surgery	154 (31,7)	103 (21,2)	140 (28,8)	–
2008	Sharma et al. (2008a)	2005	United Kingdom	253	Colorectal surgery	75 (31,1)	42 (17,4)	64 (26,6)	–
2008	Soler et al. (2008)	–	12 European countries	1393	Multiple	599 (43,0)	492 (35,0)	445 (32,0)	167 (12,0)
2008	Twellaar et al. (2008)	2002	The Netherlands	349	General practice	–	–	–	68 (19,4)
2007	Embriaco et al. (2007a)	2004	France	606	Intensive care	–	–	–	64 (10,6)
2007	Garelick et al. (2007)	2002–04	United Kingdom	121	Multiple	73 (64,0)	44 (38,6)	45 (39,5)	21 (18,4)
Burnout definition = bidimensional definition									
2018	Truchot et al. (2018)	–	France	435	Emergency	111 (23,0)	47 (10,0)	–	39 (8,0)
2018	Vijendren et al. (2018)	2014	United Kingdom	121	Otorhinolaryngogy-surgery	–	–	–	35 (28,9)
2017	Sulaiman et al. (2017)	–	Ireland	265	Multiple	93 (35,0)	82 (31,0)	72 (27,0)	70 (26,4)
2016	O'Kelly et al. (2016)	2014	United Kingdom and Ireland	575	Urology	165 (28,6)	155 (26,9)	180 (31,3)	166 (28,9)
2016	van der Wal et al. (2016)	2012	The Netherlands	514	Anaesthesiology	–	–	–	102 (19,8)
2012	Upton et al. (2012)	–	United Kingdom	313	Surgery	103 (33,0)	99 (32,0)	19 (6,0)	62 (20,0)
2011	Houkes et al. (2011)	2002 2004	The Netherlands	212 212	General practice	– –	– –	– –	42 (20,0) 19 (9,0)
2006	Panagopoulou et al. (2006)	2004	Greece	103	Internal medecine	17 (16,5)	9 (9)	–	–
Burnout definition = unidimensional definition (considering any of the three dimensions)									
2018	Fisher Pedersen et al. (2018)	2012	Denmark	588	General practice	102 (17,4)	81 (13,8)	201 (34,2)	147 (25,0)
2018	Győrffy et al. (2018)	2013	Hungary	4784	Multiple	1060 (22,2)	849 (19,0)	1781 (39,7)	–
2018	Lazarescu et al. (2018)	2013–2014	France	166	Radio-oncology	49 (30,0)	62 (37,0)	52 (31,0)	104 (63,0)
2018	Marques et al. (2018)	2014–2015	Portugal	53	Multiple	20 (38,0)	10 (19,0)	18 (34,0)	–
2018	Mikalauskas et al. (2012)	2017	Lithuania	220	Intensive care and anaesthesiology	75 (34,1)	57 (25,9)	85 (38,6)	93 (42,3)
2017	Banerjee et al. (2017)	2013–2014	41 European countries	595	Oncology	266 (44,7)	300 (50,4)	205 (34,5)	425 (71,4)
2016	Dréano-Hartz et al. (2016)	2012–2013	France	309	Palliative care	27 (9,0)	12 (4,0)	71 (23,0)	–
2014	Eelen et al. (2014)	–	Belgium	70	Multiple	27 (38,9)	19 (27,6)	5 (6,7)	35 (50,0)

Table 1 (continued)

Year of publication	Sources (references)	Year of survey	Country	Sample size (*N*)	Specialty	Prevalence *N* (%)			
						High EE	High DP	Low PA	Overall burnout
2012	Mikalauskas et al. (2012)	2009	Lithuania	59	Cardiac surgery and anaesthesiology	11 (19,3)	15 (25,9)	25 (42,3)	37 (62,0)
2012	Renzi et al. (2012)	2009	Italy	155	Multiple	60 (38,7)	33 (21,0)	6 (4,0)	–
2011	Chivato Pérez et al. (2011)	2008	Spain	404	Allergology	135 (33,3)	115 (28,5)	39 (9,7)	–
2008	Brøndt et al. (2008)*	2004	Denmark	379	General practice	–	–	–	89 (24,1)
2006	Morais et al. (2006)	2005	Portugual	263	Anaesthesiology	151 (57,9)	239 (90,9)	116 (44,8)	–
Burnout definition = unidimensional definition (only considering the EE dimension)									
2017	Nitzsche et al. (2017)	–	Germany	152	Hematology and oncology	22 (14,5)	–	–	22 (14,5)
2016	Weigl et al. (2017)	–	Germany	29	Emergency	21 (72,4)	–	–	21 (72,4)
2015	Torppa et al. (2015)	2011	Finland	165	General practice	30 (18,0)	–	–	30 (18,0)
2014	Meerten et al. (2014)	2002–11	United Kingdom	868	Multiple	515 (59,0)	–	–	515 (59,0)
2014	Tijdink et al. (2014)	2011	The Netherlands	437	Multiple	104 (23,8)	–	–	104 (23,8)
2013	Vicentic et al. (2013)	–	Serbia	120	General practice and psychiatry	70 (58,3)	–	–	70 (58,3)
2012	Probst et al. (2012)	–	United Kingdom	87	Radiotherapy	33 (38,0)	–	–	33 (38,0)
2007	Rø et al. (2007)	2003–05	Norway	226	Multiple	111 (49,0)	–	–	111 (49,0)

EE emotional exhaustion, *DP* depersonalization, *PA* personal accomplishment

–Data not provided by the authors

*Study presented twice: two definitions of burnout provided

questionnaire and cross-sectional studies make population selection process voluntary-based, thus respondents may be more at a risk of burnout than non-respondents.

Although recommended for meta-analyses (Stroup et al. 2000), the quality assessment of studies is not consensual among researchers. The fact that we use the adapted version of the NOS, a controversial tool (Borges Migliavaca et al. 2020; Moskalewicz and Oremus 2020) may mislead in part our estimates. However, using quality assessment for studies' ranking (and not for inclusion or exclusion) we may have reduced this effect (Borges Migliavaca et al. 2020). In addition, our sensitivity test showed no influential study in our meta-analysis.

Another point to be alerted about is that meta-analysis on prevalences are at acute risk of having large sample studies to have more weight on the pooled prevalence (Barendregt et al. 2013). Thus pooled prevalence have to be interpreted only in terms of frequency but not of variation (Saha et al. 2008). Therefore, this potential bias can be minimize by performing a double arcsine transformation and employing MetaXL software, which is considered an improvment tool for prevalence meta-analyses as it allows to take into account quality through quality effects model (Barendregt et al. 2013).

By covering Europe, we choose to explore a limited but still wide zone to bring interesting data on burnout prevalence among physicians from a restricted geographical area not already explored on this subject. We also restricted the area to decrease heterogeneity due to populations' predictable differences when considering very large geographical

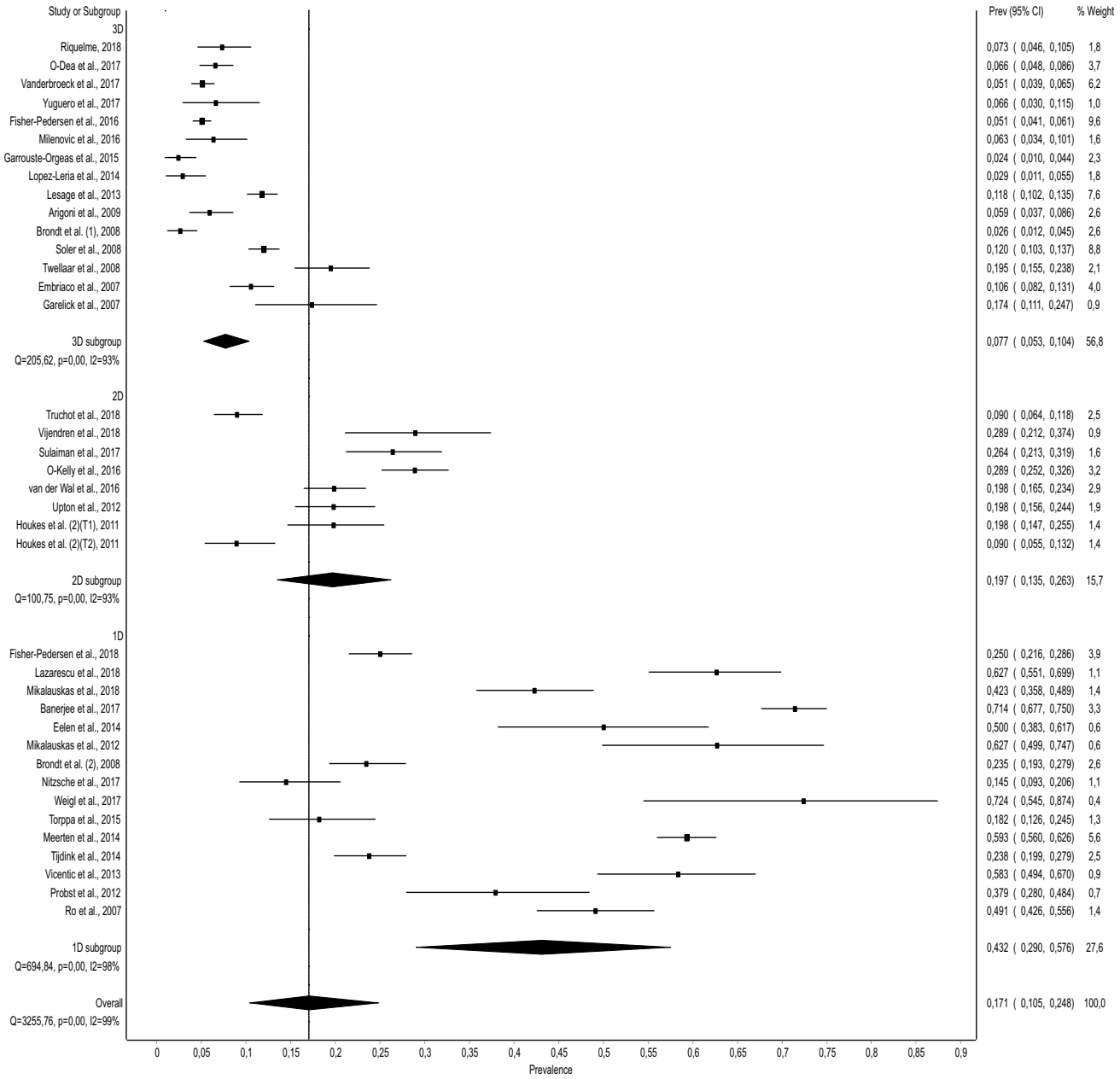

Fig. 2 Forest plot of burnout prevalence rates (36 studies). *3D* tridimensional, *2D* bidimensional, *1D* unidimensional, *CI* confidence intervals, *Q* Cochran *Q* test, I^2 I^2 value. Studies are classified in each of the three subgroups according to the dimensional definition provided by the authors (tri, bi or unidimensional definition) for the 36 studies included for burnout meta-analysis. In each subgroup, studies are listed by year of publication (most recent first) and then alphabetically among studies having the same publication year. Squares are for burnout prevalence rate and lines for their 95% confidence. Diamonds show pooled prevalence of each subgroup and of overall burnout (three subgroups together) but this last estimate should not be considered

areas. Obviously, from one European country to another, populations' differences remain, causing heterogeneity to persist. For example, a recent study (Barker et al. 2021) has investigated whether people from one country experienced burnout differently from another: it highlighted the fact that cultural and country-linked issues are of limited investigation in the literature and showed that cultural factors may play a role on burnout. In the present study, we did not actually investigate how different European geographical areas may affect our burnout prevalence estimates.

Our 12-year study time period from 2006 to 2008, allowed us to include a consequent number of studies giving strength to our meta-analysis. However, having such an extended time period may affect studies' prevalence as we

may expect some burnout associated factors to vary with time.

On the other hand, our review also presents some strong points. By focusing the review on studies assessing burnout with the MBI tool and by classifying the selected articles according to the dimensional burnout definition provided by the authors, we were able to bypass the lack of consensus on burnout assessment method to perform a reliable meta-analysis on burnout prevalence rates, even if some heterogeneity remains and should be further explored. Furthermore, our study is strengthened by including a substantial number of studies involving a large number of subjects and also by the realization of heterogeneity, asymmetry and sensitivity analyses. One precision about the I^2 test (estimating statistical heterogeneity) also has to be taken into consideration for its interpretation: as studies included in meta-analyses grow with number of subjects, so does the I^2 (Rücker et al. 2008).

Study findings

The wide range of burnout prevalence among European physicians (from 2.5 to 72.4%) is pretty close to what has been found world-widely by Rotenstein et al. (2018): from 0.0 to 80.5%. The authors of this review exposed, as did Doulougueri et al. (2016), that the heterogeneity among burnout definitions, even among studies using the MBI as their assessment tool, explains in part why such a wide range of prevalence is currently found, giving researchers difficulties to perform reliable meta-analysis.

Regarding our results of burnout prevalence rates, it is to be noted that the more restrictive the definition is, the lowest the pooled prevalence is. The unidimensional pooled prevalence (43.2%) is more than doubled compared to the bidimensional pooled prevalence (19.7%) which also doubles compared to the tridimensional pooled prevalence (7.7%). This suggests that according to the definition used by the authors there is either an over or an underestimation of burnout among a research population. It is also worrying to consider that at least one, and up to four physicians, out of ten are at risk of burnout. This supports the need to pursue investigations in this domain to better understand and adequately prevent this phenomenon.

These pooled prevalence results are also concordant with results of a recent meta-analysis conducted in France (Kansoun et al. 2019). This analysis has also been performed on studies assessing burnout with the MBI tool, and has classified its data according to two different burnout definitions: one was for "severe burnout" (matching with our tridimensional definition), while the second one considered "burnout" and was defined as one abnormal score in at least one of the three dimensions (matching with our unidimensional definition). Their estimation of severe burnout pooled prevalence was 5.0%, close to our pooled prevalence of 7.7% with the tridimensional definition. The pooled prevalence for burnout was estimated at 49.0% in this study, matching with our result of 43.2% for our unidimensional definition. Burnout prevalence estimates among French physicians appears to be similar to our European results.

A slightly higher rate of burnout is reported among physicians from the United States of America, in a study conducted by Shanafelt et al. in 2015 (Shanafelt et al. 2015). Physicians from multiple specialties were included in this study using the MBI tool and defining burnout in a unidimensional approach (high score in the EE and/or DP dimensions). The prevalence showed an increase from their two time study period from 45.5% in 2011 to 54.4% in 2014.

A 2013 Chinese study (Wen et al. 2016) showed results well higher than ours, with a burnout prevalence (definition of burnout closed to the unidimensional approach) estimated at 76.9% with the MBI tool, suggesting China as an area of concern for burnout among its physicians regardless of their specialty. Another study conducted among Japanese physicians (Saijo et al. 2018), assessing burnout with the MBI tool and defining it in a unidimensional approach, found burnout prevalence well lower than ours (21.8%).

Tests on each dimensional burnout analysis, showed a substantial heterogeneity which suggests that there is an evidence of variation in the true burnout prevalence. The lack of consensual burnout assessment method is thus not sufficient to explain by itself variability among burnout prevalence from one study to another, which confirms the necessity to pursue investigations on other factors explaining this true variation, whether they are protective or risk factors. Geographical issues, for example, could be interesting ones to explore into dedicated studies.

Comparison with physicians from other world regions is difficult to realize as burnout is not necessary assessed with the MBI tool, that its dimensions are not always provided, and also because burnout study is frequently limited, in these other geographical regions, to general population or to healthcare population but without any function distinction.

In addition, our review showed a trend toward defining burnout according to the tridimensional approach (half of the studies), although some authors limited this definition to severe burnout. The second most used definition was the unidimensional one; the bidimensional approach was the least considered.

Problematic and perspectives

The first problematic encountered was the lack of consensus on burnout assessment method leading to a wide variability in burnout prevalence rates, and preventing from making reliable comparison between studies. Although the MBI tool was the most commonly used in assessing burnout, there was no consensual way to employ this research tool.

Methodological difficulties to conduct analysis on burnout prevalence rates, provided by studies which did not employ the same tool nor even the same burnout definition, appears to be a significant problem in medical literature as several studies are now highlighting it: Doulougeri et al. (2016) identified in their review five predominant approaches on burnout definition with the MBI tool, and Rotenstein et al. (2018) found more than 142 unique definitions of burnout (considering any tools) and 47 among studies using the MBI tool.

This number of provided definitions, even among studies using the MBI tool, is explained by the association of the three dimensions made by the authors to define burnout but also by: the questionnaire used (as several MBI survey exists), the cutoff scores applied to define high scores in each dimension, the shortcuts made among the MBI items or even the adaptation made by some countries to have their own validated version of the MBI.

An interesting approach in standardizing burnout assessment method would be looking at the five profiles of burnout identified by Leiter and Maslach (Burnout, Disengaged, Overextended, Ineffective and Engagement) as their use would limit the number of burnout definitions and even allow to make predictions on burnout evolution (Leiter and Maslach 2016). Another important point appearing in Leiter and Maslach's study is the fact that EE may be less efficient to identify burnout that DP, while it has been until now, considered as the main dimension of burnout.

In this context of lack of consensus on burnout assessment method, it is worthy, when comparing different studies results to be alert of the burnout definition employed by the authors, to best understand results' variability. Added to the lack of consensual method on burnout assessment there is also a lack of standardized method on how to conduct a meta-analysis of prevalence and on which statistics is best to perform in this context (which might also result in burnout measurment inconsistency).

Another point to explore would be about how methodological differences on burnout assessment affect studies conducted on burnout associated factors. Many studies have been conducted on burnout and its associated (risk and/or protective) factors but, would not it be more appropriate to keep considering these factors as research tracks, as long as a consensual burnout assessment method is not validated?

The rise of consideration around burnout inside the medical and general population led to the consideration of this phenomenon as a clinical condition which must be "diagnosed" (Roelofs et al. 2005; Schaufeli et al. 2001). Clinically diagnosed burnout syndrome appears to be relevant but is also problematic in the way the diagnosis itself is made. First, because burnout assessment tools were developed for the research domain (Brenninkmeijer and VanYperen 2003) and need adaptation to become diagnosis tools (assessing burnout for research is made at a collective level, while it is made at an individual level for a diagnosis); second, because these tools are not sufficient to identify burnout symptoms by themselves; and third, because burnout clinical definition was also not consensual at the time of the included studies (defined as unidimensional in the 10th revision of the ICD) ("World Health Organization. International Classification of Diseases 10th Revision 2016,"). Since 2019, burnout syndrome is defined in a tridimensional approach in the 11th revision of the ICD ("WHO|Burn-out an 'occupational phenomenon,'" n.d.), however, it does not appear in the 5th edition of the Diagnostic and Statistical Manual of Mental Disorders from the American Psychiatric Association (American Psychiatric Association 2015).

Although The Netherlands is the first and unique country to use the MBI as a clinically validated tool to diagnose burnout (Brenninkmeijer and VanYperen 2003; Roelofs et al. 2005; Schaufeli et al. 2001), other countries start providing practical recommendations. A recent report in France promotes the identification of burnout syndrome among a population through the MBI tool, but recommends at an individual level the use of other tools (such as the Copenhagen Burnout Inventory, Burnout Measure or the Oldenburg Burnout Inventory) associated with a clinical evaluation (searching for psychological and somatic symptoms) and an evaluation of the work environment (Haute Autorité de Santé 2017).

As research is the background for clinical improvement, it appears important to first strongly understand burnout in a research approach to finally be able to extrapolate to clinical practice. The particularity of clinical practice being to be individual-centred, it is not to compare with the research approach (done in a collective way). Clinicians must be vigilant and have to consider clinical burnout in a multiple approach, which could be found in analysing the individual profile associated with the analysis of his coping strategies, predicting factors, social, personal and occupational environment for example. A dedicated tool could be developed specially for this purpose. Further investigations are needed on this point but, for now, the extrapolation of the MBI tool, by itself, as a burnout diagnosis tool is to be avoided.

Conclusion

Burnout prevalence rates showed a wide variability among the population of European physicians between 2006 and 2018. When taking into account burnout dimensional definitions, this wide variability persists between the subgroups, while the range is less extensive inside a subgroup. It is one of the many question around burnout that remain unsolved and the starting point of finding responses would be the validation of a consensus on burnout assessment

method, to standardized the measure of burnout prevalence in the research domain. Burnout assessment tools should also be more protocoled to avoid the multiplicity of ways to employ them. It would then allow researchers to precisely identify not only burnout risk and preventive factors, but also its consequences. A methodological and statistical model could then be fixed to compare the weight of risk factors for burnout by country and by medical specialty for example. Finally, considering clinical practice, clinicians need to be careful on how they assess burnout as the MBI tool appears to be not appropriate for diagnosis and rather dedicated for research domain.

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Declarations

Conflict of interest The authors declare no conflicts of interest to disclose.

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