

# BMJ Open How defensive medicine is defined in European medical literature: a systematic review

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## ABSTRACT

**Objectives** Defensive medicine has originally been defined as motivated by fear of malpractice litigation. However, the term is frequently used in Europe where most countries have a no-fault malpractice system. The objectives of this systematic review were to explore the definition of the term 'defensive medicine' in European original medical literature and to identify the motives stated therein.

**Design** Systematic review.

**Data sources** PubMed, Embase and Cochrane, 3 February 2020, with an updated search on 6 March 2021.

**Methods** Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses, we reviewed all European original peer-reviewed studies fully or partially investigating 'defensive medicine'.

**Results** We identified a total of 50 studies. First, we divided these into two categories: the first category consisting of studies defining defensive medicine by using a narrow definition and the second category comprising studies in which defensive medicine was defined using a broad definition. In 23 of the studies (46%), defensive medicine was defined narrowly as: health professionals' deviation from sound medical practice motivated by a wish to reduce exposure to malpractice litigation. In 27 studies (54%), a broad definition was applied adding ... or other self-protective motives. These self-protective motives, different from fear of malpractice litigation, were grouped into four categories: fear of patient dissatisfaction, fear of overlooking a severe diagnosis, fear of negative publicity and unconscious defensive medicine. Studies applying the narrow and broad definitions of defensive medicine did not differ regarding publication year, country, medical specialty, research quality or number of citations.

**Conclusions** In European research, the narrow definition of defensive medicine as exclusively motivated by fear of litigation is often broadened to include other self-protective motives. In order to compare results pertaining to defensive medicine across countries, future studies are recommended to specify whether they are using the narrow or broad definition of defensive medicine.

**PROSPERO registration number** CRD42020167215.

## INTRODUCTION

The term defensive medicine (DM) originated in the US medical research literature in

## Strengths and limitations of this study

- This systematic review was based on a systematic and thorough search of literature, performed independently by two researchers in concordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines.
- The protocol for this study was peer-reviewed and published.
- The scientific quality of each reviewed study was assessed by use of standardised quality assessment tools.
- Only English language studies were included in this systematic review.
- Only a limited number of synonyms of defensive medicine were included.

the late 1960s.<sup>1</sup> DM has been associated with rising healthcare costs, overtreatment and diagnosing of patients, and decreased trust in the physician–patient relationship, leading patients to mistrust physicians' motives and physicians to regard patients as potential plaintiffs.<sup>2–6</sup> Moreover, physicians report a development towards decreased medical authority, decreased job satisfaction and increased inequality in healthcare as possible consequences of DM.<sup>7,8</sup>

The original, what we have termed 'narrow', definition of DM states that DM is defined as 'physicians deviating from sound medical practice due to fear of liability claims and lawsuits'.<sup>3,9–12</sup> DM can be active, also called positive, for example, when ordering extra tests and procedures; and DM can be passive, also called negative, indicating that high-risk patients and procedures are avoided.<sup>3,9,10,12</sup> In the USA, DM is considered a consequence of the legislation not adequately protecting the physicians from tort,<sup>3</sup> expensive individual malpractice insurances<sup>13</sup> and the fact that the risk of malpractice claims decreases with increasing use of medical resources.<sup>14</sup> However, contrary to the USA, malpractice

litigation is rare in many European countries, such as the Netherlands,<sup>15 16</sup> Denmark,<sup>7</sup> Switzerland<sup>17</sup> and the UK.<sup>18</sup> The medicolegal systems in these European countries do not hold physicians financially liable for malpractice or other treatment-related adverse events. Furthermore, in some European countries patients entitled to it are compensated for avoidable injuries by the government not requiring prove of healthcare provider negligence.<sup>19–21</sup> This is known as a no-fault system. Nevertheless, DM is frequently reported in Europe and a substantial part of research on DM originates from Europe.<sup>6 7 15 18 22–24</sup> This raises the question whether the definition of DM as deviations motivated primarily by litigious concerns holds true in European countries where physicians are not subjected to tort legislation to the same degree as in the USA.<sup>18</sup> A recent study found that Danish general practitioners understand DM in a broader way, including motives without relation to fear of lawsuit.<sup>7</sup> To interpret the increasing number of European studies of DM correctly, it is relevant to explore the definition of DM found in European studies.<sup>25</sup> Hence, this systematic review aims to explore the definition of the term ‘DM’ in European original medical literature and to identify the stated motives therein.

## METHODS

This systematic review was conducted in concordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).<sup>26</sup>

### Patient and public involvement

Patients or the public were not involved in the design, conduct, reporting or dissemination of our research.

### Protocol and registration

The protocol is published in BMJ Open, doi:10.1136/bmjopen-2019-034300 (see online supplemental file 1).

### Amendments to the published study protocol

For clarification, the aim was rephrased from ‘To analyse variations in the definitions and understandings of the term ‘DM’ in European research articles’ to ‘To explore the definition of the term ‘DM’ in European original medical literature and to identify the stated motives therein’. Inclusion criteria 5 was simplified from, ‘DM is stated as part of the study’s aim/objective in at least one of the following ways: a. DM is included in the publication’s aim/objective. b. DM is implicitly a significant part of the aim/objective’ to ‘DM is a significant part of the aim/objective’. Inclusion criteria 6 was rephrased from ‘European data are included in the study’ to ‘The study includes data from Europe’. Eligible studies were searched on 3 February 2020, with an updated search on 6 March 2021.

### Eligibility criteria

Studies were included in the systematic review based on the following criteria:

### Inclusion criteria

1. One or both terms ‘DM’ and ‘defensive practice’ are stated in the title or the abstract.
2. The study is available in full-text and English language.
3. DM is performed by or related to physicians.
4. The study is original research (quantitative, qualitative or mixed-methods primary research or systematic review) published in a peer-reviewed medical, scientific journal.
5. DM is a significant part of the aim/objective.
6. The study includes data from Europe.

### Information sources

Eligible studies were searched in three databases: PubMed, Embase, and Cochrane, 3 February 2020, with an updated search on 6 March 2021.

### Search strategy

In the database PubMed, the MeSH term ‘defensive medicine’ was combined with the entry terms ‘defensive practice’, ‘defensive practices’ and ‘medicine, defensive’. Consequently, the search string: ‘defensive medicine OR defensive practice OR defensive practices OR medicine, defensive’ was applied. Reference lists of eligible studies were manually checked for additional relevant studies. The literature search was updated before the final analysis. See online supplemental appendix 1, online supplemental file for detailed search string.

### Study records

#### Data management

Publications found by the search strategy were exported into the reference management software EndNote<sup>27</sup> and Covidence,<sup>28</sup> where the systematic screening and data extraction were performed. Studies not existing in full text in the selected databases were searched at the library. Numbers of citations were found in Web of Science on 7 May 2021.<sup>29</sup>

### Selection process

To ensure inter-rater reliability and compliance with the inclusion criteria, in a two-phase screening, two researchers (NB and PLS) independently reviewed the full texts of all potentially relevant studies for eligibility. Disagreements were resolved through discussion in the research group until consensus was reached.

### Data collection process

#### Data extraction

NB and PLS independently registered the following information for all eligible studies: name of the first author, year of publication, research design, country of origin, sample size, medical specialty investigated, number of citations, study objective, any stated definition of DM, and all motives regarded as defensive in the study.

### Data synthesis

For each study, the stated definition of DM was reviewed and assessed by all the six researchers. The stated

definitions were extracted if they comprised constructions such as: 'DM is...', 'DM is defined as...', 'DM refers to...' or 'DM is characterised by...'. If a study did not explicitly state a definition of DM, an interpretation of the study's introduction to DM was made and excerpts to support the interpretation were extracted. If a study's definition of DM was stated with references, these references were recorded and, by chain searching, followed back to the original source. The stated definitions of DM were categorised according to the included actions (eg, 'deviation from sound medical practice') and motivations (eg, 'fear of lawsuit') using qualitative content analysis.<sup>30</sup> Next, any motives regarded as defensive were identified in the text, tables, figures as well as in the data collection methods in order to examine whether they differed from the motives stated in the study's definition of DM. Studies where researchers differed in the extraction and categorisation of DM motives were discussed among all researchers sometimes leading to rephrasing, merger, or de novo creation of categories. This was an iterative process until consensus could be reached.

### Quality assessment

The researchers independently assessed the quality of the studies. Qualitative studies were assessed using the Critical Appraisal Skills Programme.<sup>31</sup> Quantitative, mixed-methods and cross-sectional studies were all assessed using the Cross-Sectional Appraisal Tool with questions adapted from Guyatt *et al.*<sup>32 33</sup> Any relation between the studies' quality and definition of DM were assessed.

### Outcomes and prioritisation

The main outcome is categorisation of the identified definitions of DM in the European medical studies based on actions and motives for practising DM. Furthermore, studies applying different definitions of DM are compared regarding year of publication, country, medical specialty, study design, research quality and number of citations.

## RESULTS

### Study selection and characteristics

We identified 151 studies on DM worldwide meeting inclusion criteria 1–6, of which 101 studies were from countries outside of Europe (figure 1). The studies were published during 1972–2021. Among those, the 50 European studies included in this systematic review<sup>2 3 5–8 16–20 22–25 34–68</sup> were published during 1995–2020 with a steep increase in publications during the recent years (table 1, figure 2).

The European studies were performed in 12 different countries, mainly UK (n=12), Italy (n=10) and Spain (n=6). One study included data from 74 countries<sup>56</sup> and one study only mentioned the continents included.<sup>61</sup> The studies encompass 39 medical specialties with general practice (n=14), obstetrics and gynaecology (n=12), emergency department (n=9), general surgery (n=8) and anaesthesiology (n=8) emerging as dominant sources of research data. Forty-eight studies (96 %) have

a cross-sectional design, of which 37 (74%) are surveys, 6 (12%) are interview studies and 3 (6%) are combined survey and interview studies. One study is an evolutionary game theory and one study is a theoretical analysis model. No systematic reviews regarding DM were identified. The studies have various aims, including how physicians practice DM, the prevalence of DM, the cost of DM, the motives/reasons for practising DM, medical overuse, the adverse effects of DM, medicolegal systems, impact of complaints and litigations, how complaint processes can be improved, the quality and cost of healthcare, the experience of regret following diagnostic decisions, solutions to reduce DM, doctors' well-being, low-value medical practice, and how DM is understood (online supplemental table 1).

### Definitions of DM

We identified the following two main categories of DM definitions (online supplemental table 1).

1. A narrow definition of DM as health professionals' deviation from sound medical practice motivated by a wish to reduce exposure to malpractice liability, n=23 (46%).
2. A broad definition of DM adding ... or other self-protective motives, n=27 (54%).

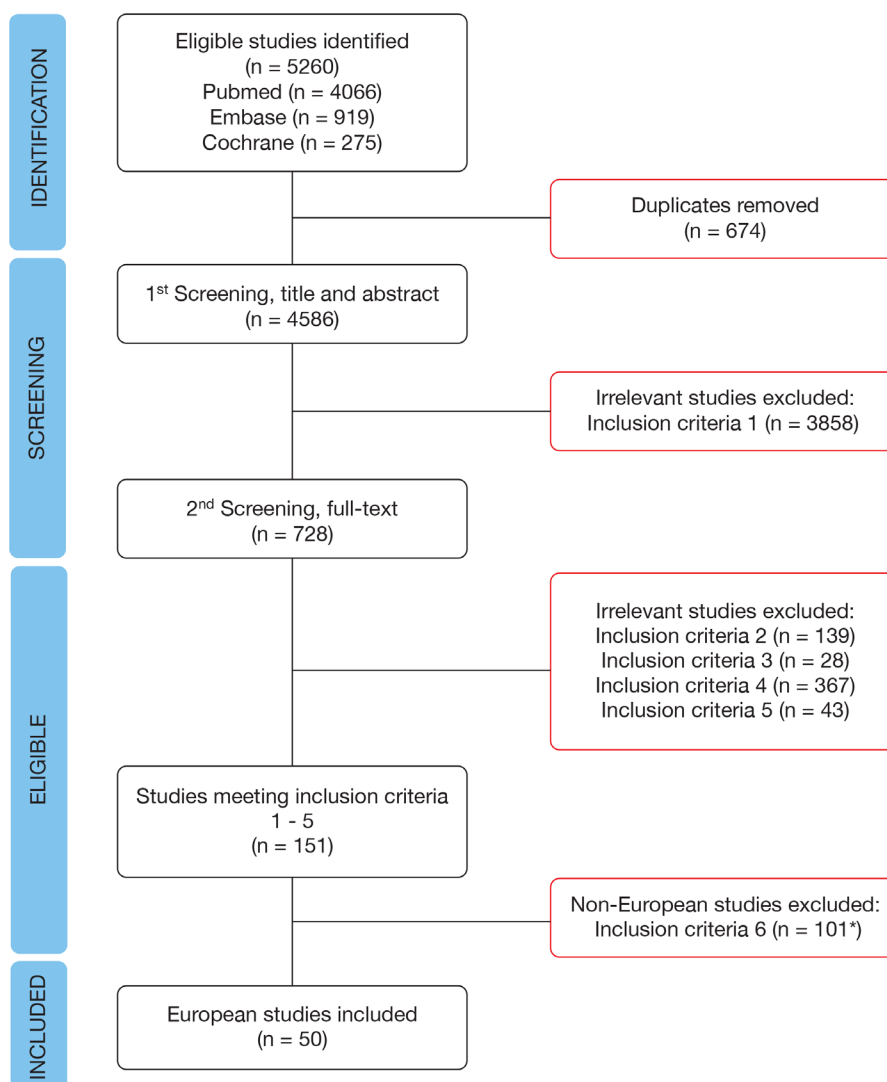
Based on the 27 studies applying a broader definition of DM, we identified other self-protective motives different from fear of malpractice liability influencing DM. We grouped these additional self-protective motives into the following four categories.

#### Fear of patient dissatisfaction

Panella *et al.*<sup>3</sup> Tanriverdi *et al.*<sup>55</sup> and Osorio *et al.*<sup>63</sup> state that having a poor physician–patient relationship or a challenging communication with patients will motivate physicians to conduct DM in order to establish a better relationship to the patient. Tanriverdi *et al.*<sup>55</sup> suggest that physicians' fear of exposure to patients' verbal and/or physical violence motivates them to conduct DM. According to Tanriverdi *et al.*<sup>55</sup> Rohacek *et al.*<sup>17</sup> and Osorio *et al.*<sup>63</sup> physicians feel pressured to practice DM due to demands from an increasing population of 'consumeristic' patients and/or relatives who request specific more or less indicated medical tests and examinations. Osorio *et al.*, p. 464<sup>63</sup> suggest that DM 'may contribute to building trust between professionals and patients'. Panella *et al.*<sup>3</sup> state that DM can be performed to increase patient satisfaction, reduce patient risk and put the patients' needs at the centre. Likewise, Van Boven *et al.*<sup>16</sup> Symon<sup>53</sup> and Elli *et al.*<sup>38</sup> find that physicians' wish to reassure the patient was a motive for them practising defensively.

#### Fear of overlooking a severe diagnosis

Rohacek *et al.*<sup>17</sup> Tebano *et al.*<sup>56</sup> and Osorio *et al.*<sup>63</sup> find that fear among physicians of missing out on something, or of making medical errors that have serious consequences for the patient, leads physicians to act defensively. Fear of receiving complaints or lawsuits following such errors



**Figure 1** Flow chart of study selection process Inclusion criteria: (1) One or both terms ‘defensive medicine’ and ‘defensive practice’ are stated in the title or the abstract. (2) The study is available in full-text and English language. (3) Defensive medicine is performed by or related to physicians. (4) The study is original research (quantitative, qualitative or mixed-methods primary research or systematic review) published in a peer-reviewed medical, scientific journal. (5) Defensive medicine is a significant part of the aim/objective. (6) The study includes data from Europe. \*USA,<sup>11 12 14 76–145</sup> New Zealand,<sup>74 75 146 147</sup> China,<sup>148–150</sup> Japan,<sup>151 152</sup> Iran,<sup>153</sup> Israel,<sup>154–160</sup> Sudan,<sup>161</sup> Canada,<sup>162 163</sup> Australia,<sup>164 165</sup> South Africa,<sup>166</sup> Singapore,<sup>167</sup> India,<sup>168</sup> Hong Kong,<sup>169</sup> Brazil<sup>170</sup> and one study from both USA, Canada and South Africa.<sup>73</sup>

are not necessarily part of the physicians’ main concerns as stated by Panella *et al*, p. 4<sup>48</sup>: ‘A second victim is likely to be a physician that experiences liability. On the other hand, a physician can be a second victim with or without having been sued. We believe that being a second victim is a better predictor of practising DM than the mere liability experience and exposure, because it better measures the personal anxiety and emotional toll of physicians that harmed their patients and suffered for their own actions’. In line with this argument, Summerton<sup>22</sup> states that diagnostic difficulties and uncertainty motivate physicians to act defensively. Moreover, Müller *et al*<sup>62</sup> state that physicians’ insight into colleagues’ incident reports and experiences contributes to an increase in defensive practice. Lindenthal *et al*, p. 176<sup>42</sup> define DM as ‘increasing

referrals and diagnostic tests for fear of missing something or making the wrong diagnosis’.

#### Fear of negative publicity

Panella *et al*,<sup>3</sup> Catino and Celotti,<sup>6</sup> Ramella *et al*,<sup>25</sup> and Passmore and Leung<sup>49</sup> state that physicians act defensively due to fear of negative publicity and mass media being negatively biased towards physicians. Moreover, Ramella *et al*, p. 424<sup>25</sup> highlight that ‘more than 68% of physicians stated that the climate of opinion that exists towards doctors was one of the major issues for practising DM, and there is an upward trend with regard to more experienced respondents’. Physicians’ fear of compromising their professional reputation, image and/or career is thus seen as contributing to DM.<sup>3 6 25 45 47 51</sup>



**Table 1** Studies included in the analysis listed after year of publication

Study	Year of publication	Country of origin	Specialty	Study design	Sample size, N	No of citations 7 May 2021
Summerton <sup>52</sup>	1995	UK	General practice	Cross-sectional study (survey)	300	110
Van Boven <i>et al</i> <sup>16</sup>	1997	The Netherlands	General practice	Cross-sectional study (survey)	18	19
Lindenthal <i>et al</i> <sup>42</sup>	1999	The Netherlands and USA	Physicians*	Cross-sectional study (survey)	2355	6
Summerton <sup>22</sup>	2000	UK	General practice	Cross-sectional study (survey)	339	26
Symon <sup>54</sup> (Litigation and defensive clinical practice: quantifying the problem)	2000	UK and Scotland	Obstetrics and Midwifery	Cross-sectional study (survey)	2001	24
Symon <sup>53</sup> (Litigation and changes in professional behaviour: a qualitative appraisal)	2000	UK and Scotland	Obstetrics, Neonatology and Midwifery	Cross-sectional study (interview)	30	11
Vimercati <i>et al</i> <sup>57</sup>	2000	Italy	Obstetrics	Cross-sectional study (survey)	63	23
Passmore <i>et al</i> <sup>49</sup>	2002	UK	Psychiatry	Cross-sectional study (survey)	96	34
Brilla <i>et al</i> <sup>24</sup>	2006	Germany and USA	Neurology	Cross-sectional study (interview + survey)	67	11
Catino <i>et al</i> <sup>6</sup>	2009	Italy	General practice, general surgery, Specialist (uncategorised), Anaesthesiology	Cross-sectional study (survey)	431	19
Steurer <i>et al</i> <sup>18</sup>	2009	Switzerland	General practice, Internal medicine	Cross-sectional study (survey)	231	15
Feess <sup>39</sup>	2012	Germany	Physicians*	Theoretical analysis, model	0	11
Rohacek <i>et al</i> <sup>17</sup>	2012	Switzerland	Emergency department	Cross-sectional study (survey)	140	29
Elli <i>et al</i> <sup>38</sup>	2013	Italy	Gastroenterology	Cross-sectional study (survey)	64	22
Ortashi <i>et al</i> <sup>46</sup>	2013	UK	Medicine, surgery, obstetrics and gynaecology, paediatrics, other specialties	Cross-sectional study (survey)	204	52
Domingues <i>et al</i> <sup>37</sup>	2014	Portugal	Obstetrics	Cross-sectional study	168 cases	4
Garcia-Retamero <i>et al</i> <sup>2</sup>	2014	Spain	General practice	Cross-sectional study (interview + survey)	160	25
Litchfield <i>et al</i> <sup>43</sup>	2014	UK	General practice	Cross-sectional study (interview)	11	2
Renkema <i>et al</i> <sup>50</sup>	2014	The Netherlands	Physicians*	Cross-sectional study (interview)	22	16
Solaroglu <i>et al</i> <sup>51</sup>	2014	Turkey	Neurosurgery	Cross-sectional study (survey)	404	9
Bourne <i>et al</i> <sup>5</sup>	2015	UK	Physicians*	Cross-sectional study (survey)	7926	72
Motta <i>et al</i> <sup>44</sup>	2015	Italy	Otolaryngology	Cross-sectional study (survey)	100	6
Osti <i>et al</i> <sup>47</sup>	2015	Austria	Orthopaedic surgery, trauma surgery, radiology	Cross-sectional study (survey)	183	12
Ramella <i>et al</i> <sup>25</sup>	2015	Italy	Radiation oncology	Cross-sectional study (survey)	361	13
Tanriverdi <i>et al</i> <sup>55</sup>	2015	Turkey	Oncology	Cross-sectional study (survey)	146	1

Continued

Table 1 Continued

Study	Year of publication	Country of origin	Specialty	Study design	Sample size, N	No of citations 7 May 2021
Antoci <i>et al</i> <sup>19</sup>	2016	Italy	Physicians*	Evolutionary game theory	0	8
Bourne <i>et al</i> <sup>36</sup>	2016	UK	Physicians*	Cross-sectional study (survey)	100	17
Panella <i>et al</i> <sup>48</sup>	2016	Italy	13 specialties†	Cross-sectional study (survey)	1313	10
Assing Hvidt <i>et al</i> <sup>7</sup>	2017	Denmark	General practice	Cross-sectional study (interview)	28	15
Bourne <i>et al</i> <sup>34</sup>	2017	UK	11 specialties‡	Cross-sectional study (survey)	6144	9
Olçay <i>et al</i> <sup>45</sup>	2017	Turkey	Cardiology	Cross-sectional study (survey)	250	0
Panella <i>et al</i> <sup>3</sup>	2017	Italy	13 specialties†	Cross-sectional study (survey)	1313	19
Vandersteegen <i>et al</i> <sup>23</sup>	2017	Belgium	31 specialties§	Cross-sectional study (survey)	508	7
Yan <i>et al</i> <sup>20</sup>	2017	The Netherlands	Neurosurgery	Cross-sectional study (survey)	45	9
Kucuk <sup>40</sup>	2018	Turkey	Obstetrics and gynaecology	Cross-sectional study (survey)	108	10
Mira <i>et al</i> <sup>67</sup>	2018	Spain	General practice, paediatrics and nurses	Cross-sectional study (survey)	1904	6
Tebano <i>et al</i> <sup>56</sup>	2018	74 countries¶	Infectious diseases and clinical microbiology	Cross-sectional study (survey)	830	6
Assing Hvidt <i>et al</i> <sup>8</sup>	2019	Denmark	General practice	Cross-sectional study (interview)	28	2
Bourne <i>et al</i> <sup>35</sup>	2019	UK	Obstetrics and gynaecology	Cross-sectional study (survey)	3073	8
Laarman <i>et al</i> <sup>41</sup>	2019	The Netherlands	General practice, medical specialists and Other.	Cross-sectional study (survey)	210	2
Aranaz Andrés <i>et al</i> <sup>58</sup>	2020	Spain	Surgeons and anaesthetist	Cross-sectional study (survey)	370	1
Calikoglu <i>et al</i> <sup>69</sup>	2020	Turkey	12 specialties**	Cross-sectional study (interview + survey)	190	0
Ferorelli <i>et al</i> <sup>60</sup>	2020	Italy	Emergency department	Cross-sectional study	100 cases	1
Gadjradj <i>et al</i> <sup>61</sup>	2020	Europe, Africa, Asia and Oceania, North America and South America	Neurosurgery and other	Cross-sectional study (survey)	490	2
Müller <i>et al</i> <sup>62</sup>	2020	Germany	General practice	Cross-sectional study (survey)	29	1
Osorio <i>et al</i> <sup>63</sup>	2020	Spain	31 specialties††	Cross-sectional study (survey)	184	2
Pausch <i>et al</i> <sup>68</sup>	2020	Germany	General practice	Cross-sectional study (survey)	135	0
Vargas-Blasco <i>et al</i> <sup>64</sup>	2020	Spain	Urology	Cross-sectional study (survey)	202	0
Vizcaino-Rakosnik <i>et al</i> <sup>65</sup>	2020	Spain	Physicians*	Cross-sectional study (survey)	282	0
Young <i>et al</i> <sup>66</sup>	2020	UK	Ten specialties‡‡	Cross-sectional study (interview)	28	0

Continued

Table 1 Continued

Study	Year of publication	Country of origin	Specialty	Study design	Sample size, N	No of citations 7 May 2021
*Physicians in general, no specific specialty enlightened.						
†General surgery, anaesthesiology, internal medicine, paediatrics, psychiatry, emergency department, radiology, cardiology, urology, pathology, neurology, rehabilitation doctors and other specialties.						
‡Accident and emergency, anaesthetics, general medicine, general practice, obstetrics and gynaecology, oncology, other, paediatrics, pathology, psychiatry, radiology.						
§Acute and emergency medicine, anaesthesiology and reanimation, gynaecology and obstetrics, general surgery, neurosurgery, neurology, orthopaedic surgery, plastic, reconstructive and aesthetic surgery, urology, cardiology, dermatovenereology, internal medicine, ophthalmology, otorhinolaryngology, pulmonology, radiology, rheumatology, stomatology, physical medicine and rehabilitation, gastroenterology, geriatrics, clinical biology, medical oncology, neuropsychiatry, nuclear medicine, pathological anatomy, paediatrics, psychiatry, radiotherapy and oncology.						
¶Area of origin, continent: Europe, Africa, America, Asia, Oceania. Area of origin, countries with >20 participants: Australia, Austria, Croatia, France, Germany, Israel, Italy, Norway, Slovenia, Spain, Sweden, Turkey, UK. The five most represented countries were Germany, UK, France, Spain and Italy.						
**Anaesthesia, gynaecology and obstetrics, ENT diseases, general surgery, urology, eye diseases, orthopaedic, cardiovascular surgery, neurosurgery, plastic surgery, thoracic surgery, paediatric surgery.						
††Endocrinology, medical oncology, paediatrics, internal medicine/geriatric, cardiology, genetics, nursing, thoracic surgery, ophthalmology, plastic surgery, anaesthesiology, radiology, surgical nursing, anatomical pathology, critical care, dermatology, gastroenterology, gynaecology and obstetrics, general surgery, haematology, immunology/allergology, infectious diseases, nephrology, neurology, nuclear medicine, psychiatry, pulmonology, rehabilitation, rheumatology, trauma and orthopaedics, urology.						
‡‡Not applicable, palliative care, renal medicine, surgery, anaesthetics, emergency medicine, rheumatology, critical care, microbiology, obstetrics and gynaecology.						
ENT, ear, nose, and throat.						

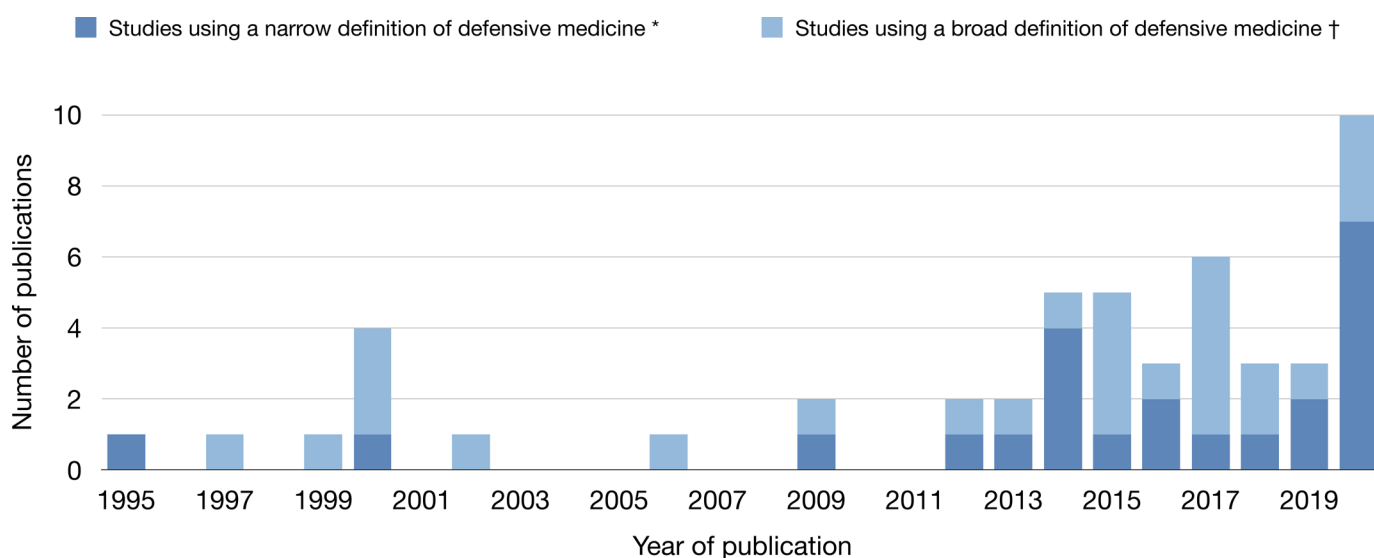
## Unconscious DM

The above-listed categories capture motives behind DM as a conscious act performed by the physician. However, Brilla *et al.*,<sup>24</sup> K    k,<sup>40</sup> Motta *et al.*,<sup>44</sup> Panella *et al.*,<sup>3,48</sup> Solaroglu *et al.*,<sup>51</sup> Vandersteegen *et al.*,<sup>23</sup> Calikoglu and Aras<sup>59</sup> and Olcay *et al.*<sup>45</sup> call attention to how DM might exist as an unconscious phenomenon, that is, physicians conduct DM on a daily basis without reflecting on why and how they do it. Supporting this argument, Yan *et al.*, p. 2347<sup>20</sup> state that ‘DM has partly become ingrained in the institutional culture of some clinics’. Therefore, the prevalence of DM is challenging to estimate, as K    k, p. 204<sup>40</sup> state: ‘Naturally, the conscious practice of DM could

be investigated in our study. We do not know the dimensions of unconscious DM practice in this regard’.

## Stated definitions

The chain search revealed that most studies refer to the same two narrow definitions of DM: 8 (16%) studies refer to Office of Technology Assessment (OTA),<sup>10</sup> 3 studies (6%) refer to Hershey<sup>11</sup> and 16 studies (32%) refer to both definitions (online supplemental table 1), online supplemental appendix 2, (online supplemental file). Seventeen studies (34%) refer to OTA<sup>10</sup> or Hershey<sup>11</sup> but nevertheless apply the broad definition of DM. Thirteen (26%) studies refer to other studies than OTA<sup>10</sup> and



**Figure 2** All European medical research studies of defensive medicine according to year of publication and whether the narrow or broad definition was applied \*A narrow definition of defensive medicine as ‘health professionals’ deviation from sound medical practice motivated by a wish to reduce exposure to malpractice liability. †A broad definition of defensive medicine adding ‘or other self-protective motives’.

Hershey<sup>11</sup> and 10 (20%) studies did not refer to any definition of DM.

### Studies using narrow versus broad DM definition

The 27 studies (54%) applying the broad definition of DM were conducted from 1997 to 2020 across 11 European countries and 38 medical specialties. No pattern was found between year of publication and use of either the narrow or broad definition of DM (figure 2). Likewise, no pattern was found between studies applying the narrow and broad definition regarding country, medical specialty, study design, number of citations.

### Quality of the studies

The quality assessment is listed in (online supplemental table 2). The assessment of two studies could not be made because the quality assessment tools were not applicable.<sup>19 39</sup> The research quality of the included studies was generally high. No pattern was found between the studies' research quality and whether a narrow or broad definition of DM was used.

## DISCUSSION

### Summary of evidence

This is the first study exploring the definition of the term 'DM' in European original medical studies. In this systematic review, more than half of the European studies used a broad definition of DM, indicating that a revised definition of DM may be needed in European countries.

Our results show that in the European scientific medical literature, already since the first studies in the late 1990s, DM has had a narrow and a broad definition. The narrow definition implies that defensiveness is motivated by the wish to reduce the health professional's exposure to malpractice claims while the broad definition includes other self-protective motives. The self-protective motives included in the broad definition include, among others, fear of patient dissatisfaction, fear of overlooking a severe diagnosis, and fear of negative publicity. Furthermore, several studies point to unconscious DM being deeply culturally imbedded and without relation to legal concerns. No pattern was found between studies applying the narrow or broad definition regarding year of publication, country, medical specialty, study design, number of citations or research quality.

### The definition of DM

The definitions presented in this systematic review, generally originates from the same two references: OTA<sup>10</sup> and Hershey.<sup>11</sup> These US sources are the most significant influencers on how European researchers define DM. OTA presented a definition in their report from 1994, p. 3.<sup>10</sup> The report rejected that the sole purpose of DM was to protect the physicians against lawsuits. As a result, the definition of DM was rephrased as follows: 'primarily (but not necessarily solely) to reduce their exposure to malpractice liability (red.)' opening for broader understandings of DM. Our systematic review

shows that 27 out of the 50 European studies on DM apply a definition of DM where deviations from sound medical practice are considered as DM also if motivated solely by other self-protective motives than fear of patient complaints.<sup>3 6-8 16 17 20 22-25 38 40 42 44 45 47-49 51 53-56 59 62 63</sup>

We often encountered the abovementioned additional motives in the studies' questionnaires. Some of the additional motives may to some extent be associated with fear of lawsuit. As an example, the category fear of patient dissatisfaction may be a result of the unspoken threat of a complaint, even if it is not clarified in the study. If this is the case, the authors should bring explicit attention to this and, for example, distinguish between DM motivated by fear of litigation and fear of patient dissatisfaction. Other identified motives such as fear of overlooking a severe diagnosis clearly goes beyond a fear of litigation and can be seen as a motive that is related to the concept of becoming a second victim, that is, physicians suffering and feeling personally responsible from an adverse patient event.<sup>48</sup>

Few researchers explicitly question the narrow DM definition nor discuss the concept of DM. When researchers do not agree on the definition of DM, it may result in an inability to compare studies. Our findings question whether the DM researched in many European studies can rightly be termed DM. Our systematic review indicates that a revised definition of DM may be needed in European countries to capture the right meaning of the medical actions that are being investigated under the label of 'DM'. Using the narrow definition of DM without reflecting on its adequacy may lead to misconceptions and consequently result in an underestimation of DM. A definition is a statement or description of the exact meaning of a word or concept.<sup>69</sup> We have shown that the term DM is not a uniformly understood term—neither analytically nor empirically. In a scientific contribution from 2020, Bester<sup>70</sup> examines DM from an ethical and professional perspective. In order to define DM, Bester<sup>70</sup> outlines what DM is and what it is not. The need to describe what DM is not, in order to understand the concept, emphasise the growing necessity of using precise and explicit conceptualisations of DM and descriptions of how the term is understood, when it is used and in which particular research context.

### The complex phenomenon of DM

DM can be perceived as a complex phenomenon comprising a number of actions provoked by various motives, dependent on contextual factors that make it difficult to compare results pertaining to DM across countries.<sup>45</sup> Specific contextual factors derive from the underlying medicolegal, welfare or healthcare systems.<sup>38 48</sup> Two European studies from 2020 find that the debates on DM are both 'confusing'<sup>71</sup> and 'slippery'<sup>72</sup> which emphasises the complexity of DM. An increased understanding of DM, and the societal and cultural factors that have contributed to its existence, is essential in order to raise the level of consciousness in clinicians of why they



act defensively. As highlighted in some of the studies above, the practice of so-called unconscious DM is likely to lead to an underestimation of the prevalence of DM. Awareness of the aspects of DM calls for a public debate and professional discussion among physicians within and across medical specialties.

Our results have expanded the definition of DM identifying numerous additional motives for practising DM. This, we hope, will contribute to an improved understanding and more nuanced discussion of the phenomenon of DM. According to several European studies, there is a need for a more detailed and clear definition of DM in order to understand the internationally widespread phenomenon more thoroughly.<sup>8 48 51 54 55</sup>

### Strength and limitations

This systematic review is based on a systematic and thorough search of the literature on DM strictly using the PRISMA guidelines which increases the validity and reliability of the results.

Although there are multiple languages used in Europe, only studies written in English have been included. However, most high-ranking scientific journals reporting on DM are written in English and we specifically aim to support future research on DM targeting an international research audience. Furthermore, DM was originally conceptualised in English.

A limitation of this systematic review is the limited number of included synonyms of DM. Other synonyms were discussed, such as defensive treatment, defensive testing, defensive behaviour, overtesting, overtreatment, unnecessary treatment, unnecessary medical care and defensive medical decision making. These terms were not included to secure the highest possible accuracy of the research question and definition of DM and thus to avoid confusion of different terms. However, during the last fifty years, other synonyms for DM may have been used increasingly in some countries or during some time periods. Additionally, the exclusion of studies due to unavailable full text or wrong study design may have left out various reflections and comprehensions of DM.

Studies where DM is a significant part of the aim/objective were included in this systematic review. This inclusion was based on the researchers' assessment that cannot be characterised as objective, thus other researchers might not assess and include in exactly similar ways.

As this is the first study systematically studying the definition of DM in European medical literature, it was not possible to compare our results with other similar studies.

### Future research

The phenomenon of DM has only been examined in few qualitative studies, cf. table 1. More qualitative study designs are needed, using different types of data generation methods, for example, observation of the clinician-patient interaction in the clinic, individual interviews or focus group interviews with clinicians across specialties and/or with patients in order to investigate the

understandings of the term and the perceived consequences of DM for the physician-patient relationship and for the physician's job satisfaction. Insights from studies employing these research designs will enable future work with clarifying and reconceptualising the phenomenon of DM. The geographical delimitation to Europe excluded countries like New Zealand and Canada that has medicolegal systems like that in the UK.<sup>73-75</sup> DM studies from these countries are likely to deviate from the original, narrow definition of DM in ways similar to what we have demonstrated in the European studies. However, it is beyond the scope of this systematic review to identify and analyse the underlying medicolegal systems of countries worldwide. Investigating the interrelationship between medicolegal system and DM in future research could contribute to an understanding of how medicolegal systems influence the motives for practising DM.

### CONCLUSION

This systematic review addresses the variations in the definition of the term 'DM' in European studies and the motives for practising DM. As such, it provides a broader and more nuanced definition of the complex and non-beneficial phenomenon of DM, hereby supporting the quality of future research on DM.

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## Appendix 1

Detailed search string from Pubmed.

defensive medicine OR defensive practice OR defensive practices OR medicine, defensive

("defensive medicine"[MeSH Terms] OR ("defensive"[All Fields] AND "medicine"[All Fields]) OR "defensive medicine"[All Fields]) OR ("defensive medicine"[MeSH Terms] OR ("defensive"[All Fields] AND "medicine"[All Fields]) OR "defensive medicine"[All Fields]) OR "defensive practice"[All Fields]) OR ("defensive medicine"[MeSH Terms] OR ("defensive"[All Fields] AND "medicine"[All Fields]) OR "defensive medicine"[All Fields]) OR ("defensive"[All Fields] AND "practices"[All Fields]) OR "defensive practices"[All Fields]) OR ("defensive medicine"[MeSH Terms] OR ("defensive"[All Fields] AND "medicine"[All Fields]) OR "defensive medicine"[All Fields]) OR ("medicine"[All Fields] AND "defensive"[All Fields]))

## Appendix 2

Detailed chain search and all references of the studies' definition of defensive medicine. Listed after articulated definition of defensive medicine complement to Supplementary Table 1 –

Definitions of defensive medicine.

\*No reference to the definition of defensive medicine. †Full text not available.

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- No reference.

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## Supplementary Table 1. Definitions of defensive medicine

Listed after articulated definition of defensive medicine. Data are excerpts from the studies. The references gained with the chain search are presented. See Appendix 2, Supplementary File, for detailed chain search and all references of the studies' definition of defensive medicine.

Author, year, country	Aim/objective	Stated definition of defensive medicine	Excerpts contributing with other self-protective motives different from fear of malpractice liability influencing defensive medicine
<b>Definition no. 1:</b> <i>A narrow definition of DM as health professionals' deviation from sound medical practice motivated by a wish to reduce exposure to malpractice liability</i>			
<b>Antoci et al. 2016, Italy</b>	<p>"We explain the complex (and somewhat paradoxical) interactions between defensive medicine, malpractice litigation and clinical risk by means of evolutionary game theory."</p> <ul style="list-style-type: none"> <li>- How physicians practice defensive medicine</li> </ul>	<p>"Defensive medicine is the practice performed by health care providers to safeguard themselves from patients' claims, while disregarding improvements in patients' health."</p> <p>"It can take the form of avoidance behavior and is called negative defensive medicine when the physician refuses to perform high risk procedures. It can also take the form of assurance behavior and is called positive defensive medicine when it is performed using extra tests or procedures."</p> <p>Reference: Report of the Secretary's Commission on Medical Malpractice(1), Duke Law(2), Kessler et al.(3)</p>	No additional motives.
<b>Aranaz Andrés et al. 2020, Spain</b>	<p>"Objective: To know the frequency and causes of low value surgical practices, according to the opinion of surgeons and anesthetists, and to determine their degree of knowledge about the Spanish "Choosing wisely" initiative."</p> <ul style="list-style-type: none"> <li>- Low-value medical practice</li> </ul>	<p>"The greatest responsibility for overuse was attributed to physicians, defensive medicine and mass media."</p> <p>"In addition, defensive medicine is given a greater weight as a determinant factor of overuse, almost 10 percentage points of what was considered in a similar study by primary care physicians, which is probably due to the greater frequency of judicial claims against surgical professionals."</p> <p>Reference: Mira et al.(4), McQuade(5), Office of Technology Assessment (OTA)(6)</p>	No additional motives.
<b>Bourne et al. 2015, UK</b>	"The primary aim was to investigate the impact of complaints on doctors' psychological welfare and health. The secondary aim was to assess	"It is important to note that they also described clinicians involved in complaints practising medicine more defensively. Such practise may be broadly	No additional motives.

	<p>whether doctors report exposure to a complaints process is associated with defensive medical practise.”</p> <ul style="list-style-type: none"> <li>- How physicians practice defensive medicine</li> <li>- The prevalence of defensive medicine</li> <li>- Impact of complaints and litigations</li> <li>- Doctors’ well-being</li> </ul>	<p>categorised into ‘hedging’ and ‘avoidance’. Hedging is when doctors are overcautious, leading, for example, to overprescribing, referring too many patients or over investigation. Avoidance includes not taking on complicated patients and avoiding certain procedures or more difficult cases.”</p> <p>Reference: Jain et al.(7)</p>	
<b>Bourne et al. 2016, UK</b>	<p>“To examine doctors’ experiences of complaints, including which aspects are most stressful. We also investigated how doctors felt complaints processes could be improved.”</p> <ul style="list-style-type: none"> <li>- Impact of complaints and litigations</li> <li>- How complaint processes can be improved</li> </ul>	<p>“The result is that complaints are associated with clinicians practising medicine more defensively; This pattern of behaviour includes hedging (over prescribing, over referral, over investigation) and avoidance (changing specialty or profession, avoiding high risk patients or procedures, abandoning procedures early).</p> <p>Reference: Davis(8), Verhoef et al.(9), Jain et al. (7), Shanafelt et al.(10), Cooper et al.(11), Hershey(12)</p>	No additional motives.
<b>Bourne et al. 2017, UK</b>	<p>“How adverse outcomes and complaints are managed may significantly impact on physician well-being and practice. We aimed to investigate how depression, anxiety and defensive medical practice are associated with doctors actual and perceived support, behaviour of colleagues and process issues regarding how complaints investigations are carried out.”</p> <ul style="list-style-type: none"> <li>- Impact of complaints and litigations</li> <li>- Doctors’ well-being</li> </ul>	<p>“*practised medicine more defensively following complaints against themselves or colleagues. This involved ‘hedging’, which includes performing more tests than necessary, over-referral and overprescribing as well as ‘avoidance’, which includes avoiding procedures, not accepting high-risk patients or abandoning procedures early.”</p> <p>Reference: no reference.</p>	No additional motives.
<b>Bourne et al. 2019, UK</b>	<p>”To determine the prevalence of burnout in doctors practising obstetrics and gynaecology, and assess the association with defensive medical practice and self-reported well-being.”</p> <p>“The aims were firstly to ascertain the prevalence of burnout in the cohort, secondly to determine the levels of DMP (defensive medical practice) and doctor well-being and explore their relationship with burnout. Finally, we aimed to explore the relationships between age, gender, ethnicity, doctor seniority, and both</p>	<p>“Defensive medical practice (DMP) is defined as a doctor’s deviation from standard practice in response to complaints or criticism which can potentially harm patients as a result of either overinvestigation and treatment or because clinicians avoid involvement in difficult cases.”</p> <p>Reference: Hershey(12), Klingman et al.(13), Rosenblatt et al.(14), Grumbach et al.(15), Van Boven et al.(16), McQuade(5), Hershey(17), Dingwall(18), Office of Technology Assessment (OTA)(6), Summerton(19)</p>	No additional motives.

	<p>burnout and DMP.”</p> <ul style="list-style-type: none"> <li>- How physicians practice defensive medicine</li> <li>- The prevalence of defensive medicine</li> <li>- Doctors’ well-being</li> </ul>		
<b>Domingues et al. 2014, Portugal</b>	<p>”The authors aimed to assess the Portuguese circumstances concerning situations of medico-legal dispute in Obstetrics, evaluate the conclusions of technical-scientific opinions and analyze their consequences.”</p> <ul style="list-style-type: none"> <li>- Medicolegal system</li> </ul>	<p>”...facing the threat of professional liability cases, many doctors change their clinical attitude to a defensive medicine practice, whose exercise may not always be beneficial to the patient, by prescribing unnecessary exams or even by giving up or avoiding areas of activity more susceptible to litigation.”</p> <p>Reference: Hammond(20), Laros(21), Mavroforou et al.(22), Hammond et al.(23), Pearlman et al.(24), Bettes et al.(25), American College of Obstetricians and Gynecologists(26), U.S. Senate Subcommittee on Nutrition and Human Needs(27), Marieskind(28), Danforth(29), Sachs(30), Shiono et al.(31), Office of Technology Assessment(32), Sloan et al.(33), Report of the Secretary’s Commission on Medical Malpractice(1), Duke Law(2), Howard(34), Owolabi et al.(35), Kravitz et al.(36), Chan et al.(37), MacLennan et al.(38), Queenan(39), Frigoletto et al.(40), Queenan(41)</p>	No additional motives.
<b>Feess 2012, Germany</b>	<p>”Hence, the problem of negative medicine is likely to be an important one, and the purpose of our paper is analyzing the impact of the trade-off between technology choice and care levels chosen on the second best optimal liability rule.”</p> <ul style="list-style-type: none"> <li>- Medicolegal system</li> <li>- Impact of complaints and litigations</li> </ul>	<p>“...trying to reduce liability risks, doctors adopt treatments and carry out tests adding little or nothing to the patient’s health, measures usually referred to as positive defensive medicine.”</p> <p>”...avoiding the liability exposure by adopting the safe technology. We refer to this distortion toward the safe technology as negative defensive medicine.”</p> <p>Reference: U.S. Senate Subcommittee on Nutrition and Human Needs(27), Marieskind(28), Kessler et al.(3), Kessler et al.(42), Danforth(29), Sachs(30), Shiono et al.(31), Office of Technology Assessment(32)</p>	No additional motives.
<b>Ferorelli et al. 2020, Italy</b>	<p>”The aim of this study is to quantify the rate and investigate the causes of head CT scan over prescription in an Emergency Department,</p>	<p>“*defensive medicine, in which the practice is motivated by legal rather than medical reasons.”</p>	No additional motives.

	<p>trying to reduce inappropriate prescriptions. The ultimate purpose is to guarantee efficiency, effectiveness, patient safety matching demand of services, and real need of health care. This point of view is part of the modern health governance aimed at rationalization of health cost and appropriate allocation of resources, without forgetting the guarantees of any healthcare service. This study is aimed to improve prescriptive appropriateness as to reduce waiting times, to optimize choices and resources in patient interest, to calculate waste, and to reduce defensive medicine promoting a no-blame culture.”</p> <ul style="list-style-type: none"> <li>- Medical overuse</li> </ul>	<p>“Defensive Medicine occurs when doctors order tests, procedures, and visits or avoid high-risk patients and procedures, primarily to reduce their exposure to malpractice liability.”</p> <p>Reference: Office of Technology Assessment (OTA)(6), Report of the Secretary's Commission on Medical Malpractice(1), Duke Law(2), Hershey(12)</p>	
<b>Gadjradj et al. 2020, Europe and other</b>	<p>“The extent to which the practice of defensive medicine is linked to experience with malpractice lawsuits remains unclear. The aims of this study were to clarify this by surveying neurosurgeons about the frequency of experiencing medical lawsuits and to show how neurosurgeons reflect on facing such lawsuits.”</p> <ul style="list-style-type: none"> <li>- How physicians practice defensive medicine</li> <li>- The prevalence of defensive medicine</li> <li>- Impact of complaints and litigations</li> <li>- Medicolegal system</li> </ul>	<p>“Due to fear of legal repercussions, physicians may be more inclined to practice defensive medicine, basing their decisions on legal rather than medical standards. This form of practicing medicine may stimulate physicians to perform unnecessary, additional therapeutic or diagnostic interventions that do not improve the medical condition of the patient (also referred to as positive defensive medicine), or it may cause physicians to refer or refuse difficult cases (also referred to as negative defensive medicine).”</p> <p>Reference: Hershey(12), Klingman et al.(13), Rosenblatt et al.(14), Grumbach et al.(15), Kessler et al.(43), Office of Technology Assessment (OTA)(6), Report of the Secretary's Commission on Medical Malpractice(1), Duke Law(2)</p>	No additional motives.
<b>Garcia-Retamero et al. 2014, Spain</b>	<p>”To investigate whether and why doctors practice defensive medicine with their patients.”</p> <ul style="list-style-type: none"> <li>- How physicians practice defensive medicine</li> <li>- The motives/reasons for practicing defensive medicine</li> </ul>	<p>“Given the high number of malpractice litigations, it is not surprising that more and more doctors practice some form of defensive medicine. (...) Defensive medicine is practised around the world: Evidence for both positive (e.g. increased diagnostic testing and increased follow-ups) and negative (e.g. avoiding treating certain conditions and patients) defensive practices has been found in...*.”</p> <p>Reference: Chen(44), Nakajima et al.(45), Summerton(19), Hershey(12), Office of Technology</p>	No additional motives.



		Assessment (OTA)(6), Brilla et al.(46), Klingman et al.(13), Rosenblatt et al.(14), Grumbach et al.(15)	
<b>Laarman et al. 2019, The Netherlands</b>	<p>“The objective of this study is to describe the experience of medical doctors with and the perceived impact of a disciplinary procedure and a disciplinary measure.”</p> <ul style="list-style-type: none"> <li>- Impact of complaints and litigations</li> </ul>	<p>“A second concern is the phenomenon of ‘defensive medicine’, referring to the practice of performing additional and unnecessary diagnostic tests or the avoidance of high-risk medical treatments for patients in an effort to avoid complaints or claims.”</p> <p>Reference: Panella et al.(47), Hershey(12), Klingman et al.(13), Rosenblatt et al.(14), Grumbach et al.(15), McQuade(5), Office of Technology Assessment (OTA)(6), Kessler et al.(43), Van Boven et al.(16), Hershey(17), Dingwall(18), Summerton(19), Panella et al.(48)</p>	No additional motives.
<b>Litchfield et al. 2014, UK</b>	<p>”Aim: To gain an understanding of the family practitioner’s (FP) medical and non-medical motives for ordering an LFT (liver function tests) and the influence of various social and technical factors on this decision.”</p> <ul style="list-style-type: none"> <li>- How physicians practice defensive medicine</li> </ul>	<p>“The ‘external’ influences on test ordering included litigative pressure for defensive practice, (...)”</p> <p>Reference: no reference.</p>	No additional motives.
<b>Mira et al. 2018, Spain</b>	<p>” Objectives: Identify the sources of overuse from the point of view of the Spanish primary care professionals, and analyse the frequency of overuse due to pressure from patients in addition to the responses when professionals face these demands.”</p> <ul style="list-style-type: none"> <li>- Medical overuse</li> </ul>	<p>“As a defensive measure against possible future claims.”</p> <p>Reference: no reference.</p>	No additional motives.
<b>Ortashi et al. 2013, UK</b>	<p>“The objectives of this study were to assess the prevalence of the practice of defensive medicine in the UK among hospital doctors and the factors affecting it.”</p> <ul style="list-style-type: none"> <li>- The prevalence of defensive medicine</li> <li>- The motives/reasons for practicing defensive medicine</li> </ul>	<p>“Defensive medicine is defined as a doctor’s deviation from their usual behavior or that considered good practice, to reduce or prevent complaints or criticism by patients or their families. The United States Congress expand this definition to include the action of ordering tests, procedures and visits, or avoidance of high risk patients or procedures with the primary (but not sole) aim, of reducing malpractice liability. A more narrow approach was adopted in Summerton’s 2000 study on defensive medical practices in General Practice; ‘the ordering of</p>	No additional motives.

		<p>treatments, tests, and procedures for the purpose of protecting the doctor from criticism rather than diagnosing or treating the patient'. Defensive medical practices can be either positive or negative. When extra tests and procedures are performed primarily to reduce malpractice liability, this is a positive defensive medicine. Negative defensive medicine consists of avoidance of certain patients and procedures, thereby withdrawing medical services, and can deny patients productive care."</p> <p>Reference: Van Boven et al.(16), McQuade(5), Hershey(17), Dingwall(18), Office of Technology Assessment (OTA)(6), Summerton(19)</p>	
<b>Pausch et al. 2020, Germany</b>	<p>"Medical overuse is a common problem in health care. Preventing unnecessary medicine is one of the main tasks of General Practice, so called quaternary prevention. We aimed to capture the current opinion of German General Practitioners (GPs) to medical overuse."</p> <ul style="list-style-type: none"> <li>- Medical overuse</li> </ul>	<p>"Causes of medical overuse were also attributed to external factors such as patient expectations and fear of litigation resulting in defensive medicine."</p> <p>Reference: Bishop et al.(49)</p>	No additional motives.
<b>Renkema et al. 2014, Italy</b>	<p>"The objective of this study was to identify conditions that influence the relationship between malpractice litigation risk and physicians' behaviors."</p> <ul style="list-style-type: none"> <li>- The motives/reasons for practicing defensive medicine</li> <li>- Impact of complaints and litigations</li> </ul>	<p>"Defensive medicine includes performing unnecessary medical procedures and tests, deviating from guideline practices and avoiding high-risk patients."</p> <p>Reference: Hershey(12), Klingman et al.(13), Rosenblatt et al.(14), Grumbach et al.(15), DeKay et al.(50), Report of the Secretary's Commission on Medical Malpractice(1), Duke Law(2), Lysdahl et al.(51)</p>	No additional motives.
<b>Steurer et al. 2009, Switzerland</b>	<p>"Using PSA screening as an example, we surveyed Swiss general physicians about their beliefs related to the benefits of screening and assessed to what extent liability fears influenced their recommendations for testing."</p> <ul style="list-style-type: none"> <li>- Impact of complaints and litigations</li> </ul>	<p>"Defensive medicine, 'a deviation from sound medical practice that is indicated primarily by a threat of liability'."</p> <p>Reference: Hershey(12), Klingman et al.(13), Rosenblatt et al.(14), Grumbach et al.(15)</p>	No additional motives.

<b>Summerton 1995, UK</b>	<p>“To investigate defensive medical practices among general practitioners; (b) to compare any such practices with general practitioners' understanding of certain aspects of the terms of service and medical negligence and practitioners' concerns about the risk of being sued or having a complaint lodged.”</p> <ul style="list-style-type: none"> <li>- How physicians practice defensive medicine</li> <li>- Impact of complaints and litigations</li> </ul>	<p>“Defensive medicine may be defined as the "ordering of treatments, tests and procedures for the purpose of protecting the doctor from criticism rather than diagnosing or treating the patient." Other workers have extended this definition to include the avoidance and the reduction of risk taking. The concept may also be subdivided into positive and negative aspects. Negative defensive practice occurs when the general practitioner performs in a way that goes against Dingwall's concept of socially and clinically ideal levels. This may be taken to include such things as prescription of unnecessary drugs; increases in follow up, referral rate, and diagnostic testing, as well as avoidance of certain treatments and the removal of patients from the practitioner's list. In contrast, positive defensive medical practices are defined as quality improvements such as increased screening, development of audit or consumer satisfaction activities, and more detailed patient explanations or detailed note taking.”</p> <p>Reference: McQuade(5), Hershey(17), Dingwall(18)</p>	No additional motives.
<b>Vargas-Blasco et al. 2020, Spain</b>	<p>”The objective of this study is to assess, in a similar way to the U.S. survey, the impact of MPL (Medical Professional Liability) claims on Spanish urologists, evaluating their frequency and detecting areas of special risk, as well as analyzing their repercussions on patients professionals.”</p> <ul style="list-style-type: none"> <li>- Impact of complaints and litigations</li> </ul>	<p>“Beyond professionals’ well-being, results of this survey confirm that facing a medial malpractice claim significantly affects doctor-patient relationships and increases defensive medicine behaviors, which had been repeatedly mentioned before.”</p> <p>Reference: Sanbar et al.(52)</p>	No additional motives.
<b>Vimercati et al. 2000, Italy</b>	<p>“To evaluate the perception of “Defensive Medicine” by hospital-based obstetricians and the influence of this attitude on the choice of caesarean delivery.”</p> <p>The motives/reasons for practicing defensive medicine</p>	<p>“Defensive medicine is a term that describes the particular attitude of people involved in health care who increase the use of tests and procedures in order to avoid or to protect themselves against malpractice suits.”</p> <p>Reference: no reference.</p>	No additional motives.
<b>Vizcaíno-Rakosnik et al. 2020, Spain</b>	<p>”Our aim was to examine how malpractice claims brought against physicians impact (a) psychologically their well-being and (b) work performance.”</p>	<p>“It has been suggested that claims may lead to defensive medical practices, such as ordering extra test.”</p>	No additional motives.

	- Impact of complaints and litigations	Reference: Charles(53)	
<b>Young et al. 2020, UK</b>	<p>"The present study aims to explore clinician attitudes towards our different nudge-type educational messages targeting overuse, why they did or did not influence decisions to order tests, how this depends on the patient and context, and factors that may impede or facilitate wider implementation and scaling up of the intervention."</p> <p>- Medical overuse</p>	<p>"Defensive medicine refers to the fear of litigation influencing medical decision-making, including the overuse of tests and treatments."</p> <p>Reference: no reference.</p>	No additional motives.
<b>Definition no. 2:</b> <i>A broad definition of DM as health professionals' deviation from sound medical practice motivated by a wish to reduce exposure to malpractice liability or other self-protective motives</i>			
<b>Assing Hvidt et al. 2017, Denmark</b>	<p>"Thus, the aim of this study was to identify individual and shared perspectives among GPs on how defensive medicine is understood and experienced in their daily clinical work."</p> <p>- The motives/reasons for practicing defensive medicine</p> <p>- How defensive medicine is understood</p>	<p>"Defensive medicine (DM) is commonly defined as a deviation from standard medical practice due to fear of malpractice liability claims. The deviating medical practice may include two types of behaviour: an 'assurance behaviour' involving the ordering of more tests and procedures than medically indicated and an 'avoidance behaviour' in which the physician avoids high-risk procedures and/or patients to distance him/herself from malpractice liability."</p> <p>Reference: McQuade(5), Office of Technology Assessment (OTA)(6), Hershey(12), Klingman et al.(13), Rosenblatt et al.(14), Grumbach et al.(15), Kessler et al.(43), Van Boven et al.(16), Hershey(17), Dingwall(18), Summerton(19), Panella et al.(48)</p>	<p>"We found that GPs in a Danish general practice setting understand DM as unnecessary and meaningless medical actions. Drawing on their daily experiences the GPs furthermore reasoned that these defensive actions are carried out as a result of succumbing to daily pressures deriving from four different sources: the system, patients, the GPs themselves and colleagues."</p> <p>"Our research thus documents that Danish GPs understand DM in a broader and more differentiated way than how the phenomenon has predominantly been defined within the health economical and judicial literature. We assert that if other GPs, physicians and health professionals from similar cultural and organisational contexts understand and experience DM this way then the research findings of this study complement the traditional definition of DM."</p> <p>- Fear of patient dissatisfaction</p> <p>- Fear of overlooking a severe diagnosis</p> <p>- Fear of negative publicity</p>
<b>Assing Hvidt et al. 2019, Denmark</b>	"The aim of this article is to show how Jürgen Habermas' communicative action theory serves as a useful tool in analysing and interpreting empirical data on how Danish general practitioners experience defensive medicine in their everyday working life."	"Traditionally, DM is understood as physicians' deviation from sound medical practice due to fears of liability claims or lawsuits. These deviating behaviours may either take the form of avoidance behaviour (avoiding high-risk patients or procedures) or assurance behaviour (involving physicians	"*DM can be seen as a symptom of a crisis of trust in the relationship between medicine and society leading to opportunistic (and strategic) rather than altruistic (and communicative) attitudes in health care – hereby threatening the very moral and ethical impulses inherent in medicine."

	<ul style="list-style-type: none"> <li>- How physicians practice defensive medicine</li> <li>- The adverse effects of defensive medicine</li> </ul>	<p>ordering extra diagnostic tests, procedures or visits). Both behaviours aim to reduce the exposure to malpractice liability. Some shortcomings can be argued to pertain to this understanding of DM. First, an understanding of DM as motivated primarily by a perceived or actual threat of legal action does not explain why DM occurs and is experienced as so troubling to clinicians in countries with ‘no fault’ tort systems in which physicians are not held financially liable for the medical harm that they have caused and patients are compensated by the government. Second, and perhaps most importantly, understanding DM as based on litigation fears does not take the whole implicit, contextual background of DM into consideration as experienced by individual physicians.”</p> <p>Reference: Gaine(54), Office of Technology Assessment (OTA)(6), Hershey(12), Klingman et al.(13), Rosenblatt et al.(14), Grumbach et al.(15), Kessler et al.(43), Van Boven et al.(16), McQuade(5), Hershey(17), Dingwall(18), Summerton(19), Panella et al.(48)</p>	<p>”Although legal complaints constituted a significant concern among the GPs of this study, affecting their behaviour towards defensive medical practice, the fear of falling prey to a vague and all-encompassing culture of external control and blame appeared to motivate their defensive practices even more.”</p> <p>”Although the GPs were aware of the traditional understanding of DM as medical actions based on litigious concerns, they discussed its salience in their own clinical context, proposing a broader perspective on DM as involving all those unnecessary medical actions that are more substantiated by feelings of demands and pressures than meaningful clinical behaviour.”</p> <ul style="list-style-type: none"> <li>- Fear of patient dissatisfaction</li> <li>- Fear of overlooking a severe diagnosis</li> <li>- Fear of negative publicity</li> </ul>
<b>Brilla et al. 2006, Germany and USA</b>	<p>”To study whether and how fear of litigation and defensive medicine are communicated during residency training and to assess whether this affects residents’ attitudes.”</p> <ul style="list-style-type: none"> <li>- Impact of complaints and litigations</li> </ul>	<p>“It has been claimed repeatedly that the fear of litigation prompts physicians to initiate additional tests, not on medical grounds, but with the intention to avoid possible litigation or to have a more defensible case if litigation occurs later on (also called “defensive medicine”).”</p> <p>Reference: no reference.</p>	<p>”Among several possible explanations for this interesting finding, he hypothesises that “fear of malpractice may prompt to adopt (. . .) unwritten clinical standards (. . .) to prevent lawsuits. These (. . .) standards may be learned in medical school and residency programs or may diffuse informally from one clinician to another. (. . .) Once the need to practice defensively became ingrained in physicians’ behaviors, implicitly and proactively adopting defensive practices might occur relatively routinely.”</p> <ul style="list-style-type: none"> <li>- Unconscious defensive medicine</li> </ul>
<b>Calikoglu et al. 2020, Turkey</b>	<p>“This study aimed to evaluate the defensive medicine knowledge, attitudes, and behaviours of physicians working in the surgical departments of a Turkish university hospital.”</p> <ul style="list-style-type: none"> <li>- How physicians practice defensive medicine</li> <li>- The motives/reasons for practicing defensive medicine</li> </ul>	<p>“The concept of defensive medicine, also known as defensive medical decision making, first appeared in 1978, and is broadly defined as medical behaviors that avoid physician liability without providing increased benefits to the patient. Specific defensive practices include ordering unnecessary tests or procedures, avoiding high-risk patients or services, or referring patients to specialty providers. Defensive medicine is included in the MeSH terms of PubMed</p>	<p>“The majority of physicians practice defensive medicine without purpose or unintentionally.”</p> <ul style="list-style-type: none"> <li>- Unconscious defensive medicine</li> </ul>



	<ul style="list-style-type: none"> <li>- How defensive medicine is understood</li> </ul>	<p>as ‘the alterations of modes of medical practice, induced by the threat of liability, for the principal purposes of forestalling lawsuits by patients as well as providing good legal defense if such lawsuits are instituted’.”</p> <p>“Defensive medicine represents health professional behaviour intended to prevent malpractice from administrative, criminal, legal, and ethical sanctions. Physicians order tests and avoid treating high-risk patients (when they have a choice) to reduce their exposure to lawsuits, or are forced to discontinue practicing because of overly high insurance premiums. There are two primary forms of defensive medicine. When physicians perform extra tests or procedures primarily to reduce malpractice liability, they are practicing positive defensive medicine. When they avoid individual patients or processes, they are practicing negative defensive medicine.”</p> <p>Reference: Office of Technology Assessment (OTA)(6), Hershey(12), NCBI(55), Klingman et al.(13), Rosenblatt et al.(14), Grumbach et al.(15)</p>	
<b>Catino et al. 2009, Italy</b>	<p>“The object of the present study is to investigate the professional behaviour of doctors in Italy with a view to determining whether they practice defensive medicine and, if so, in what form and to what extent. ... *it focuses on the following concerns of doctors: the fear of having to face litigation; the fear of receiving claims for compensation; and the fear of compromising their reputation and jeopardising their career.”</p> <ul style="list-style-type: none"> <li>- How physicians practice defensive medicine</li> <li>- The prevalence of defensive medicine</li> <li>- Impact of complaints and litigations</li> </ul>	<p>“Defensive medicine takes place when doctors, motivated primarily by the objective of reducing their exposure to medical malpractice litigation, prescribe unnecessary tests, procedures or specialist visits, or, alternatively, avoid patients or procedures that involve a high level of risk. When doctors engage in the excessive use of tests and procedures, they practice <i>positive defensive medicine</i>. When they avoid certain patients or procedures, they practice <i>negative defensive medicine</i>.”</p> <p>Reference: Office of Technology Assessment (OTA)(6)</p>	<p>“The fear of negative publicity. A substantial component of the general practitioners interviewed in the NS (43.5%) expressed concern about the accusatory approach adopted by the media. In the LS the surgeons revealed a particularly marked fear of negative publicity and the loss of image.”</p> <ul style="list-style-type: none"> <li>- Fear of negative publicity</li> </ul>
<b>Elli et al. 2013, Italy</b>	<p>“The aim of this study was to clarify the impact of defensive medicine on gastroenterological practices in Lombardy.”</p> <ul style="list-style-type: none"> <li>- How physicians practice defensive</li> </ul>	<p>“This “defensive medicine” (DM) represents a deviation from sound medical practice that is primarily induced by the threat of liability. DM consists of two main behaviours, one ‘assuring’ (sometimes called positive DM) and the other</p>	<p>“Thirty-four respondents (54%) reported practising DM in order to minimise the risk of legal action by patients, and 19 (30%) in order to decrease the risk of legal action by patients and hospital; the rest said they did so because they found DM-oriented practices reassuring. Forty-six respondents</p>

	<p>medicine</p> <ul style="list-style-type: none"> <li>- The prevalence of defensive medicine</li> <li>- The cost of defensive medicine</li> </ul>	<p>‘avoiding’ (sometimes called negative DM).”</p> <p>Reference: Hershey(12), Klingman et al.(13), Rosenblatt et al.(14), Grumbach et al.(15), McQuade(5), Hershey(17), Dingwall(18), Office of Technology Assessment (OTA)(6), Chawla et al.(56), Grepperud(57), U.S. Senate Subcommittee on Nutrition and Human Needs(27), Marieskind(28), Sloan et al.(58)</p>	<p>(72%) reported that they had been asked for DM-oriented procedures by general practitioners; the remaining 28% had performed ‘defensive’ procedures because they had been requested by specialists or by both specialists and general practitioners.”</p> <ul style="list-style-type: none"> <li>- Fear of patient dissatisfaction</li> </ul>
<b>Kucuk 2018, Turkey</b>	<p>“In the current study, opinions and attitudes of OB/GYNs regarding defensive medicine and to what extent they practice defensive medicine are investigated.”</p> <ul style="list-style-type: none"> <li>- The prevalence of defensive medicine</li> <li>- The motives/reasons for practicing defensive medicine</li> </ul>	<p>“Defensive medicine, in a general sense, is a term that describes the actions taken by the health professionals to reduce the probability of being sued rather than helping the patient.”</p> <p>“There is negative- and positive-defensive medicine depending on the circumstances. On one hand, positive-defensive medicine may emerge as unneeded hospitalisations, prescriptions or diagnostic tests and procedures which are unnecessary. On the other hand, negative defensive medicine includes abstaining from necessary procedures, treatments or hospitalisations that are assumed risky.”</p> <p>Reference: Office of Technology Assessment (OTA)(6), Turley(59), Kessler et al.(3)</p>	<p>“Naturally, the conscious practice of defensive medicine could be investigated in our study. We do not know the dimensions of unconscious defensive medicine practice in this regard.”</p> <ul style="list-style-type: none"> <li>- Unconscious defensive medicine</li> </ul>
<b>Lindenthal et al. 1999, The Netherlands and USA</b>	<p>”Objective: To compare attitudes of consumers in America and Holland toward the quality and cost of healthcare.”</p> <ul style="list-style-type: none"> <li>- The quality and cost of healthcare</li> </ul>	<p>“Defensive medicine (increasing referrals and diagnostic tests for fear of missing something or making the wrong diagnosis).”</p> <p>Reference: no reference.</p>	<p>“Defensive medicine (increasing referrals and diagnostic tests for fear of missing something or making the wrong diagnosis).”</p> <ul style="list-style-type: none"> <li>- Fear of overlooking a severe diagnosis</li> </ul>
<b>Motta et al. 2015, Italy</b>	<p>“This study aims at verifying relationships between the perception of medico-legal risks involved in the professional activity of Italian otolaryngologists, defensive medical behaviour and their understanding of professional liability insurance in matters of civil liability.”</p> <ul style="list-style-type: none"> <li>- How physicians practice defensive medicine</li> <li>- The motives/reasons for practicing defensive medicine</li> </ul>	<p>“Defensive medicine is defined as the ordering of tests and procedures (positive defensive medicine), or the avoidance of high-risk patients or procedures (negative defensive medicine), primarily to reduce exposure to malpractice liability.”</p> <p>Reference: Office of Technology Assessment (OTA)(6)</p>	<p>“This behaviour (*defensive medicine) has become deeply ingrained in many physicians’ practices resulting in a difficult to quantify “unconscious” defensive medicine.”</p> <ul style="list-style-type: none"> <li>- Unconscious defensive medicine</li> </ul>

	- Medicolegal system		
<b>Müller et al. 2020, Germany</b>	<p>” The aim of this study was to explore the experience of regret following diagnostic decisions in primary care.”</p> <p>- The experience of regret following diagnostic decisions</p>	<p>“However, reducing the risk of possible regret, as is the case in defensive medicine, may result in additional risks to patients.”</p> <p>Reference: Sorum et al.(60)</p>	<p>“However, reducing the risk of possible regret, as is the case in defensive medicine, may result in additional risks to patients. When shared with colleagues, such experiences may have wider implications for local norms and standards among health care professionals. This issue was also raised in a study on the determinants of defensive medical practices. The study showed that access to an incident reporting system had had a significant impact on most of the defensive medicine measures. Physicians with access to the system, and thereby to their colleagues’ incident reports, practiced medicine that was more defensive.”</p> <p>- Fear of overlooking a severe diagnosis</p>
<b>Olçay et al. 2017, Turkey</b>	<p>“Cardiologists participate in the diagnosis and interventional treatment of numerous high-risk patients. The goal of this study was to investigate how the current malpractice system in Turkey influences cardiologists’ diagnostic and interventional behavior and to obtain their opinions about an alternative patient compensation system.”</p> <p>- How physicians practice defensive medicine</p> <p>- Medicolegal system</p>	<p>“Defensive medicine is defined as establishing diagnoses that would not alter patient care, and performing unnecessary testing and treatments.”</p> <p>“Defensive medicine is a deviation from sound medical practice that is induced mainly by a threat of malpractice suit.”</p> <p>“Positive defensive medicine is expressed in the increased use of resources, both to reduce the risk of receiving a complaint and to increase doctors’ ability to defend one; this could be called “augmented” or “extra” medical practice. Negative defensive medicine refers to a withdrawal of medical services; for example, neurosurgeons may avoid certain patients or surgical procedures if they believe these place them at greater risk for litigation.”</p> <p>Reference: Office of Technology Assessment (OTA)(6), Vandijck et al.(61), Office of Technology Assessment(62), Office of Technology Assessment(63), U.S. Senate Subcommittee on Nutrition and Human Needs(27), Marieskind(28), Kessler et al.(3), Kessler et al.(42), Dewar(64), Hershey(12), Klingman et al.(13), Rosenblatt et al.(14), Grumbach et al.(15), Danforth(29), Sachs(30), Shiono et al.(31), Office of Technology Assessment(32)</p>	<p>“Self-reports of defensive medicine may be biased, and doctors may overstate the frequency of performing defensive medicine. By its very nature, the unconscious practice of defensive medicine will not be reported by doctors.”</p> <p>“The fear of litigation and loss of reputation are the major reasons for the practice of defensive medicine.”</p> <p>- Fear of negative publicity</p> <p>- Unconscious defensive medicine</p>

<p><b>Osorio et al. 2020, Spain</b></p>	<p>”The aims of this study were to explore healthcare professionals’ opinions about low-value practices, identify practices of these kind possibly present in the hospital and barriers and facilitators to reduce them.”</p> <ul style="list-style-type: none"> <li>- Low-value medical practice</li> </ul>	<p>“Regarding barriers to reduce low-value care, defensive medicine was identified as an important barrier perceived by professionals to reduce low-value practices, especially in the medical specialties. Other studies have identified this as a factor for low-value practices. The origin of this barrier have been associated with doctor-patient communication.”</p> <p>Reference: Perry Undem Research/Communication(65), Zambrana-García et al.(66), Domino et al.(67)</p>	<p>“At the micro level, the most common barrier was related to the category of defensive medicine (Table 3): “. . .in my case, is better to have one test more than one test missing. Because, if you miss something that may have dramatic consequences, for instance an undetected recurrence. So, you ended up asking for that test. Even though you know. . . you are 95% sure you will not find anything bad.”</p> <p>“Table 3: Distribution of verbatim quotations about barriers to reduce low-value practices by type of specialty. Coding was done based on topics, categories and levels. Defensive medicine: Self-protection, Previous bad experiences, Management of uncertainty” (table 3, p. 465).</p> <p>“Regarding barriers to reduce low-value care, defensive medicine was identified as an important barrier perceived by professionals to reduce low-value practices, especially in the medical specialties. Other studies have identified this as a factor for low-value practices. The origin of this barrier have been associated with doctor-patient communication. Dialog between doctors and patients is probably becoming more complex due to increasing patients’ literacy and knowledge. Furthermore, expert patients’ demands for tests that doctors may consider of low-value suggest a paradox: while it is a low-value practices, it may contribute to building trust between professionals and patients.”</p> <ul style="list-style-type: none"> <li>- Fear of patient dissatisfaction</li> <li>- Fear of overlooking a severe diagnosis</li> </ul>
<p><b>Osti et al. 2015, Austria</b></p>	<p>“Even though European literature recognizes the incorporation of defensive practice in routine medical services, a gap of knowledge about the factual defensive dimensions is evident. The objective of the present investigation was therefore to assess prevalence and medico-legal context of defensive practice to establish a solid basis for appreciation and discussion of adverse effects of defensive medicine on mutual trust, self-conception and patient safety in the Austrian health care system.”</p> <ul style="list-style-type: none"> <li>- The prevalence of defensive medicine</li> <li>- The adverse effects of defensive medicine</li> </ul>	<p>“It (*defensive medicine) is defined as medical practices that may exonerate doctors from liability without significant benefit to patients.”</p> <p>Reference: Nahed et al.(68), Catino(69)</p>	<p>“The doctors’ perception of practice environment and requested standards of medical care appear to be a common denominator of all considerations regarding defensive medicine: it is affected by insecurity, defencelessness and stigmatization as well as by deficient legal and interpersonal core assumptions. Transparency, information, clarification of facts and integration of medical professionalism and experience are essential to raise a tangible and realistic awareness regarding the principles of law, doctor’s self-perception and patient’s rights and duties as well as to obtain an efficient cooperation for the future advancement of health care systems. Medical education represents a key role for the avoidance of non-evidence-based, pure defensive diagnostics”</p>

	- Medicolegal system		- Fear of negative publicity
<b>Panella et al. 2016, Italy</b>	<p>“A second victim is ‘a healthcare provider involved in an unanticipated adverse patient event, medical error, and/or a patient-related injury, who becomes victimised in the sense that the provider is traumatised by the event’. The possible role of being second victim has never been assessed as possible determinants of DM. The objective of this study, therefore, was to identify the determinants of DM among Italian hospital doctors including being a second victim.”</p> <ul style="list-style-type: none"> <li>- The motives/reasons for practicing defensive medicine</li> <li>- The adverse effects of defensive medicine</li> </ul>	<p>“Defensive medicine (DM) is a deviation from sound medical practice that is induced primarily, but not solely, by the threat of liability claims.”</p> <p>Reference: Office of Technology Assessment (OTA)(6), Hershey(12), Klingman et al.(13), Rosenblatt et al.(14), Grumbach et al.(15), Kessler et al.(43), Van Boven et al.(16), McQuade(5), Hershey(17), Dingwall(18), Summerton(19)</p>	<p>“We also recognise that other factors may determine DM, such as the enormous variation in the medical malpractice environment, and in the healthcare and welfare systems and legal institutions across countries.”</p> <p>“The most prominent predictor for practising DM was the physicians’ experience of being a second victim after an adverse event. ... A second victim is likely to be a physician that experiences liability. On the other hand, a physician can be a second victim with or without having been sued. We believe that being a second victim is a better predictor of practising DM than the mere liability experience and exposure, because it better measures the personal anxiety and emotional toll of physicians that harmed their patients and suffered for their own actions.”</p> <p>“Self-reports can also be biased by concerns about reporting DM practices, including a ‘socially desirable response bias’. Together with unconsciously practised DM, this could lead to an underestimation of the prevalence of DM and, consequently, a possible contamination bias of the sample.”</p> <ul style="list-style-type: none"> <li>- Fear of overlooking a severe diagnosis</li> <li>- Unconscious defensive medicine</li> </ul>
<b>Panella et al. 2017, Italy</b>	<p>“To identify the prevalence of the practice of defensive medicine among Italian hospital physicians, its costs and the reasons for practising defensive medicine and possible solutions to reduce the practice of defensive medicine.”</p> <ul style="list-style-type: none"> <li>- The prevalence of defensive medicine</li> <li>- The cost of defensive medicine</li> <li>- The motives/reasons for practicing defensive medicine</li> <li>- Solutions to reduce defensive medicine</li> </ul>	<p>“Defensive medicine (DM) is a deviation from sound medical practice that is induced primarily, but not solely, by the threat of liability claims. DM consists of two behaviours, one that may supplement care (active DM) and the other that involves avoidance behaviour to distance doctors from sources of legal risks (passive DM).”</p> <p>Reference: Office of Technology Assessment (OTA)(6), Hershey(12), Klingman et al.(13), Rosenblatt et al.(14), Grumbach et al.(15), Kessler et al.(43), Van Boven et al.(16), McQuade(5), Hershey(17), Dingwall(18), Summerton(19), Panella et al.(48)</p>	<p>“Regarding the reasons for practising DM, a major determinant reported was a general negative context surrounding negligence claims against physicians. *2.8% of physicians feared compromising their professional reputation and or career. Some respondents (13.8%) perceived that an ineffective physician–patient relationship was the most important cause of DM. Some physicians (5.3%) indicated unfavourable mass media and public attitudes towards medical practices as causes, and 7.1% of physicians indicated inadequate medical and or organizational procedures.”</p> <p>“Fourteen per cent of physicians believed that DM had a positive effect on their patients, because it increased patient satisfaction, it put patients’ needs at the centre of medical care and it reduced patients’ risk.”</p> <p>“Moreover, it is impossible to measure the portion of</p>



			<p>unconscious DM, because it originates from requests by other specialists or ignorance of best practice evidence.”</p> <ul style="list-style-type: none"> <li>- Fear of patient dissatisfaction</li> <li>- Fear of negative publicity</li> <li>- Unconscious defensive medicine</li> </ul>
<b>Passmore et al. 2002, UK</b>	<p>“The aim of this report was to examine the extent of defensiveness among psychiatrists and to examine the relationship between defensiveness and seniority, as well as the effect of previous experiences on the level of defensiveness.”</p> <ul style="list-style-type: none"> <li>- The prevalence of defensive medicine</li> <li>- The motives/reasons for practicing defensive medicine</li> </ul>	<p>“One definition of defensive practice is the “ordering of treatments, tests and procedures for the purpose of protecting the doctor from criticism rather than diagnosing or treating the patient. It has been proposed that there are both positive and negative aspects of defensive practice. Examples of positive aspects might include improvements in the quality of services with more detailed explanations being given to patients and increased patient satisfaction. Examples of negative aspects might include the prescription of unnecessary treatments, increased observation levels of inpatients, and increased rates of follow up.”</p> <p>Reference: McQuade(5), Hershey(17), Dingwall(18)</p>	<p>“In the section on defensive practice, respondents were asked if they had taken any of four specified actions within the past month because of worries about possible consequences such as complaints, disciplinary action by managers, legal action, or publicity in the media.”</p> <ul style="list-style-type: none"> <li>- Fear of negative publicity</li> </ul>
<b>Ramella et al. 2015, Italy</b>	<p>“To our knowledge no data is currently available regarding the perception of risk among radiation oncologist physicians. We therefore enquired with the members of the Italian Association of Radiation Oncology (AIRO) regarding the frequency and nature of their defensive practices. We also tested whether the likelihood of this practice was associated with sociodemographic characteristics.”</p> <p>“We present here the first survey of radiation oncologists’ views regarding malpractice liability and defensive medicine practice.”</p> <ul style="list-style-type: none"> <li>- How physicians practice defensive medicine</li> <li>- The prevalence of defensive medicine</li> </ul>	<p>“Defensive Medicine occurs when doctors order tests, procedures, or visits or avoid high risk patients or procedures, primarily (but not necessarily or solely) to reduce their exposure to malpractice liability. When physicians do extra tests or procedures primarily to reduce malpractice liability they are practicing positive defensive medicine (assurance behaviour). When they avoid certain patients or procedures, they are practicing negative defensive medicine (avoidance behaviour). The problem is, however, not new. In 1972, an interesting article by Hershey entitled “The defensive practice of medicine: myth or reality” underlined that defensive medicine is a deviation from medical practice that is induced primarily by a threat of liability.”</p> <p>Reference: Office of Technology Assessment (OTA)(6), Hershey(12)</p>	<p>“Finally, more than 68 % of physicians stated that the climate of opinion that exists towards doctors was one of the major issues for practising defensive medicine, and there is an upward trend with regard to more experienced respondents.”</p> <p>“Although the threat of disciplinary actions and/or negative publicity does not seem to represent a major concern for radiation oncologists, and personal legal suits are rare, a major underlying cause for this behaviour (*defensive medicine) is the current negative climate of opinion towards doctors.”</p> <p>“Factors influencing defensive medicine behaviours: Fear of disciplinary sanctions by their medical institution or fear of negative publicity, loss of image in case of complications/adverse events...”</p> <p>“To address the problem, it is important to have a clear understanding of why this defensive behaviour is adopted and what are the underlying factors that influence it,</p>

			<p>including fear of malpractice suits and claims for damages, especially among young radiologists.”</p> <ul style="list-style-type: none"> <li>- Fear of negative publicity</li> </ul>
<b>Rohacek et al. 2012, Switzerland</b>	<p>“To identify reasons for ordering computed tomography pulmonary angiography (CTPA), to identify the frequency of reasons for CTPA reflecting defensive behavior and evidence-based behavior, and to identify the impact of defensive medicine and of training about diagnosing pulmonary embolism (PE) on positive results of CTPA.”</p> <ul style="list-style-type: none"> <li>- The prevalence of defensive medicine</li> <li>- The motives/reasons for practicing defensive medicine</li> <li>- The adverse effects of defensive medicine</li> </ul>	<p>“Defensive medicine is defined as the ordering of treatments, tests, and procedures with the primary aim of protecting the physician from liability rather than of substantially furthering the patient’s diagnosis or treatment.”</p> <p>Reference: McQuade(5), Office of Technology Assessment (OTA)(6), Hershey(17), Dingwall(18), Chawla et al.(56), Grepperud(57), U.S. Senate Subcommittee on Nutrition and Human Needs(27), Marieskind(28), Hershey(12), Klingman et al.(13), Rosenblatt et al.(14), Grumbach et al.(15), Sloan et al.(58)</p>	<p>“We hypothesized that defensive factors, such as fear of missing PE or demand from the patient or his/her relatives, could be a common reason for ordering an unnecessary CTPA, and that documentation of motivations for ordering a CTPA, coupled with appropriate training in medical decision making to diagnose PE, might influence the behavior of physicians and direct them towards evidence-based medicine.”</p> <p>“Our findings indicate that factors reflecting defensive behaviour such as “fear of missing PE” were the reason for ordering CTPA in more than half of the orders (red.). Factors like “request from the patient or his/her relatives” or “fear of being sued” played a minor role. This corresponds to a small number of prosecutions of physicians in Switzerland and stands in contrast to the USA where the risk of facing a malpractice claim is high.”</p> <ul style="list-style-type: none"> <li>- Fear of patient dissatisfaction</li> <li>- Fear of overlooking a severe diagnosis</li> </ul>
<b>Solaroglu et al. 2014, Turkey</b>	<p>“The aim of this study was to investigate the characteristics of defensive medicine, its reasons, and the extent to which it is practiced in the Turkish health care system.”</p> <ul style="list-style-type: none"> <li>- How physicians practice defensive medicine</li> <li>- The prevalence of defensive medicine</li> <li>- The motives/reasons for practicing defensive medicine</li> </ul>	<p>“Defensive medicine is defined as medical practices that help doctors avoid liability without providing any additional benefit to the patient.”</p> <p>“There are two types of defensive medicine. Positive defensive medicine is expressed by the increased use of resources, both to reduce the risk of receiving a further complaint and to increase doctors’ ability to defend one; this could be called “augmented” or “extra” medical practice. When neurosurgeons perform extra tests or procedures primarily to reduce their malpractice liability, they are practicing positive defensive medicine. Negative defensive medicine refers to a withdrawal of medical services; for example, neurosurgeons may avoid certain patients or surgical procedures if they believe these place them at greater risk for litigation.”</p> <p>Reference: Office of Technology Assessment</p>	<p>“It has been reported that fear of litigation and loss of reputation are the major causes of defensive medicine.”</p> <p>“By its very nature, the unconscious practice of defensive medicine will not be reported by doctors.”</p> <ul style="list-style-type: none"> <li>- Fear of negative publicity</li> <li>- Unconscious defensive medicine</li> </ul>

		(OTA)(6), Hershey(12), Office of Technology Assessment(62), Office of Technology Assessment(63), U.S. Senate Subcommittee on Nutrition and Human Needs(27), Marieskind(28), Kessler et al.(3), Kessler et al.(42), Dewar(64), Klingman et al.(13), Rosenblatt et al.(14), Grumbach et al.(15), Danforth(29), Sachs(30), Shiono et al.(31), Office of Technology Assessment(32)	
<b>Summerton 2000, UK</b>	<p>“This paper reports the results from a survey conducted in 1999 in which certain features indicative of negative defensive practice were compared with an identical survey conducted five years previously... The overall objective of this present study was to re-examine negative defensive medical practice in general practice and to highlight any significant changes over the past five years.”</p> <ul style="list-style-type: none"> <li>- How physicians practice defensive medicine</li> </ul>	<p>“Defensive medicine may be defined as the ordering of treatments, tests, and procedures for the purpose of protecting the doctor from criticism rather than diagnosing or treating the patient.”</p> <p>Reference: no reference.</p>	<p>“Diagnostic difficulties within primary care appear to compound defensive practice. In a survey of Dutch GPs, diagnostic uncertainty was one of the key considerations in a shift towards defensive practice.”</p> <ul style="list-style-type: none"> <li>- Fear of overlooking a severe diagnosis</li> </ul>
<b>Symon 2000, UK and Scotland,</b> <i>Litigation and defensive clinical practice: quantifying the problem</i>	<p>“To assess the evidence for claims about a rise in defensive clinical practice, particularly within maternity care; to describe an attempt to quantify the extent of defensive practice; and to identify areas for further research.”</p> <ul style="list-style-type: none"> <li>- How physicians practice defensive medicine</li> <li>- The prevalence of defensive medicine</li> </ul>	<p>One of the most significant claims about litigation is that it has allegedly introduced defensiveness in clinical practice; specifically there has been the charge that ‘tests deemed to be inaccurate are used in clinical practice because some obstetricians fear litigation’. However, the term ‘defensiveness’, though widely used, may be understood in more ways than one.</p> <p>Black (1990) characterised defensiveness in terms firstly of risk avoidance, then of risk reduction. A ‘risk avoidance’ strategy may include practitioners ‘...avoiding specialties, procedures, and patients that they perceive carry a high risk of leading to a malpractice claim’.</p> <p>Reference: Black(70), Ennis et al.(71), Simmons(72)</p>	<p>“Change in practice is almost certainly multi-factorial, and it is hard to isolate the effect of the fear of litigation on clinical practice.”</p> <p>“There is also the difficulty in deciding what constitutes defensive practice: Clements suspects ‘that one man's defensive medicine is another man's risk management’.”</p> <p>“The subject of defensive clinical practice is one which is difficult to define, and one which appears to divide practitioners with regard to its merits/demerits and implications for practice. Certain claims about the extent of defensive practice have been made, but it is not clear if the US experience will be replicated in the UK to any significant degree.”</p>
<b>Symon 2000, UK and Scotland,</b> <i>Litigation and changes in professional</i>	<p>“Concerns about an apparent rise in defensive clinical practice have centred on an alleged rise in intervention rates, particularly in maternity care. This, the second of two articles, explores the views of a number of clinical and other</p>	<p>“Claims have been made that, as a result of an apparently relentless increase in the incidence of litigation, practitioners have begun to react defensively. Among these claims are the assertion that investigations and interventions are being carried</p>	<p>“Asked about personal experience of defensive practice, the following was offered by a senior clinician: In the situation where we're withdrawing care from a baby who's been severely asphyxiated...clinically you know that baby is essentially dead, or brain dead, but you're going through the</p>

<i>behaviour: a qualitative appraisal</i>	<p>practitioners concerning defensive practices.”</p> <ul style="list-style-type: none"> <li>- Impact of complaints and litigations</li> </ul>	<p>out regardless of clinical justification.”</p> <p>Reference: no reference.</p>	<p>motions of knowing there's an EEG, or another EEG ± you may have two, three over the course of seven days, or 10 days... (Consultant Neonatologist). Such courses of action may be eminently defensible from the point of view of preparing parents for the inevitable, but it may be questioned whether barrages of expensive tests are always justifiable.”</p> <p>“Overall the responses indicated that the question of defensive practice is very much open to individual interpretation. Not all were agreed that reactions which may be thought defensive are necessarily detrimental to the standard of care, and it seems improbable that the UK (or Scotland at least) is faced with the same problems apparently encountered in parts of the USA.”</p> <ul style="list-style-type: none"> <li>- Fear of patient dissatisfaction</li> </ul>
<b>Tanriverdi et al. 2015, Turkey</b>	<p>“This study determines the attitudes and orientations of medical oncologists on defensive medicine. (red.) The survey was designed to determine the participants’ demographic characteristics and defensive medicine practices.”</p> <ul style="list-style-type: none"> <li>- How physicians practice defensive medicine</li> <li>- How defensive medicine is understood</li> </ul>	<p>“Defensive medicine is a deviation from medical practice that is induced primarily by a threat of liability.”</p> <p>““Defensive medicine occurs when doctors order tests, procedures, or visits or avoid high-risk patients or procedures, primarily - but not necessarily or solely - to reduce their exposure to malpractice liability.”</p> <p>“Acquiescing to requests for excessive medical testing or procedures is called positive defensive medicine and is practiced by physicians to avoid malpractice lawsuits, and avoiding some patients or procedures is called negative defensive medicine.”</p> <p>Reference: Baicker et al.(73), Kessler et al.(3), Kessler et al.(74), Hellinger et al.(75), Rubin et al.(76), Kessler et al.(77), U.S. Senate Subcommittee on Nutrition and Human Needs(27), Marieskind(28), Chandra et al.(78), Hershey(12), Office of Technology Assessment (OTA)(6)</p>	<p>Question in the survey: “The underlying cause of defensive medicine?” Possible answers: “Fear of litigation, poor working conditions (patient dense etc.), health policy, poor communication with patients, burnout syndrome, heroism and perfectionism, lack of financial motivation, administrative pressures, expectations of patients and their relatives.”</p> <p>“We believe that physicians of state hospital, due to their poor working environments caused by intensive outpatient rates, that defensive medicine is adjusting to these conditions. In particular, we see that the definition of defensive medicine among fellows is unclear.”</p> <ul style="list-style-type: none"> <li>- Fear of patient dissatisfaction</li> <li>- Fear of negative publicity</li> </ul>
<b>Tebano et al. 2018, 74 countries</b>	<p>“To investigate fear of legal claims and defensive behaviours among specialists in infectious diseases (ID) and clinical microbiology (CM) and to identify associated</p>	<p>“When physicians perceive litigation as a threat, they may adopt defensive behaviours as a way to reduce the chances of litigation or to ensure a form of defence in the case of malpractice claims. These</p>	<p>“It has been argued that the diffuse cultural perception of modern medicine as a perfect science can make people consider medical errors/omissions as a deviation from the correct practice in any situation. This can produce in the</p>

	<p>demographic and professional characteristics.”</p> <ul style="list-style-type: none"> <li>- How physicians practice defensive medicine</li> <li>- The motives/reasons for practicing defensive medicine</li> <li>- Impact of complaints and litigations</li> </ul>	<p>behaviours usually deviate from evidence-based practice and are known as defensive medicine. This encompasses the tendency to over-prescribe diagnostic examinations and medications, to increase consultations with other physicians as well as referrals to hospitals, and to avoid at-risk patients and procedures, all in order to reduce the likelihood of omissions or errors.”</p> <p>Reference: Kessler et al.(43), Office of Technology Assessment (OTA)(6), Van Boven et al.(16), McQuade(5), Hershey(17), Dingwall(18), Summerton(19)</p>	<p>public, as well as in doctors, an intolerance of error and a culture of blame, according to Hoffman and Kanzaria. Errors might then lead to shame and consequently some doctors prefer to act defensively, explaining why fear and defensive behaviours are not necessarily bound to a real legal threat.”</p> <ul style="list-style-type: none"> <li>- Fear of overlooking a severe diagnosis</li> </ul>
<b>Van Boven et al. 1997, The Netherlands</b>	<p>“Ordering laboratory tests and diagnostic imaging can be a part of the defensive behavior of the physician. How often does this occur in family practice in the Netherlands?”</p> <ul style="list-style-type: none"> <li>- The prevalence of defensive medicine</li> </ul>	<p>“Defensive behavior is defined as a clear deviation from the family physician’s usual behavior and from what is considered to be good practice in order to prevent complaints or criticism by the patient or the patient’s family.”</p> <p>Reference: no reference.</p>	<p>“Defensive testing varied with the clinical reasons to order a test: the wish to exclude a disease or to reassure the patient was a much stronger motive for defensive testing than the intention to confirm a diagnosis or to screen.”</p> <ul style="list-style-type: none"> <li>- Fear of patient dissatisfaction</li> </ul>
<b>Vandersteegen et al. 2017, Belgium</b>	<p>“In 2010 the Belgian government introduced a low cost administrative procedure for compensating medical injuries to overcome the major shortcomings of the existing tort system. This paper examines, for the first time, to what extent this reform had an impact on physician specialists’ defensive practices and what are the relevant determinants affecting physicians’ clinical decision making.”</p> <ul style="list-style-type: none"> <li>- Medicolegal systems</li> </ul>	<p>“Defensive medicine can be defined as the avoidance of certain high-risk procedures or patients (avoidance behaviour or negative defensive medicine), or the ordering of procedures, tests or visits (assurance behaviour or positive defensive medicine), primarily (but not solely) due to the threat of medical liability.”</p> <p>Reference: Office of Technology Assessment (OTA)(6)</p>	<p>“In addition, unconscious defensive medicine is frequently practiced, though not reported by physicians.”</p> <ul style="list-style-type: none"> <li>- Unconscious defensive medicine</li> </ul>
<b>Yan et al. 2017, The Netherlands</b>	<p>“The aim of this study is to explore perceived liability burdens and self-reported defensive behaviors among neurosurgeons in the Netherlands and compare their practices with their non-European counterparts.”</p> <ul style="list-style-type: none"> <li>- How physicians practice defensive medicine</li> <li>- Impact of complaints and litigations</li> </ul>	<p>“Defensive medicine (DM) is a departure from standard medical practices out of a fear of litigation. There are two types of defensive medicine: positive DM is the practice of prescribing unnecessary, additional medical treatment out of a fear of lawsuits, and negative DM is avoiding high-risk procedures, which could compromise clinical decision-making.”</p> <p>Reference: Office of Technology Assessment (OTA)(6), Report of the Secretary’s Commission on Medical Malpractice(1), Duke Law(2)</p>	<p>“It is possible that, while initially motivated by financial pressure, DM has partly become ingrained in the institutional culture of some clinics. DM has thus become a cultural as well as a financial phenomenon.”</p> <p>“Lastly, many factors may contribute to defensive behaviours among neurosurgeons, e.g., personal experience, confidence, and risk perception.”</p> <p>“They (*Dutch neurosurgeons) rarely view their insurance</p>



		premiums as burdensome or their patients as potential lawsuits.”
		- Unconscious defensive medicine

\*Text edited in order to increase the understanding of the text or reduce the text

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## Supplementary Table 2. Quality assessment of studies

Listed after year of publication.

Studies analysed with Critical Appraisal Skills Programme (CASP)										
Author, year, country	1. Was there a clear statement of the aims of the research?	2. Is a qualitative methodology appropriate?	3. Was the research design appropriate to address the aims of the research?	4. Was the recruitment strategy appropriate to the aims of the research?	5. Was the data collected in a way that addressed the research issue?	6. Has the relationship between researcher and participants been adequately considered?	7. Have ethical issues been taken into consideration?	8. Was the data analysis sufficiently rigorous?	9. Is there a clear statement of findings?	10. How valuable is the research (good/fair/poor)?
Symon 2000, UK and Scotland*	Yes	Yes	Yes	N/A	Yes	N/A	Yes	N/A	Yes	Fair
Litchfield et al. 2014, UK	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Good
Renkema et al. 2014, The Netherlands	Yes	Yes	Yes	Yes	Yes	N/A	N/A	Yes	Yes	Good
Bourne et al. 2016, UK	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Good
Assing Hvidt et al. 2017, Denmark	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Good
Assing Hvidt et al. 2019, Denmark	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Good
Müller et al. 2020, Germany	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Fair
Young et al. 2020, UK	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Good

Studies analysed with Cross Sectional Appraisal Tool (CSAT)											
Author, year, country	1. Did the study address a clearly focused issue?	2. Did the authors use an appropriate method to answer	3. Were the subjects recruited in an acceptable way?	4. Were the measures accurately measured to reduce bias?	5. Were the data collected in a way that addressed the research issue?	6. Did the study have enough participants to minimize the play of chance?	7. How are the results presented and what is the main result? (good/fair/poor)	8. Was the data analysis sufficiently rigorous?	9. Is there a clear statement of findings?	10. Can the results be applied to the local population?	11. How valuable is the research? (good/fair/poor)?

		their question?									
<b>Summerton 1995, UK</b>	Yes	Yes	Yes	N/A	Yes	Yes	Good	Yes	Yes	Yes	Good
<b>Van Boven et al. 1997, The Netherlands</b>	Yes	Yes	N/A	Yes	Yes	No	Fair	Yes	Yes	N/A	Fair
<b>Lindenthal et al. 1999, The Netherlands and USA</b>	Yes	Yes	Yes	Yes	Yes	Yes	Fair	Yes	Yes	Yes	Fair
<b>Summerton 2000, UK</b>	Yes	Yes	Yes	N/A	Yes	Yes	Fair	Yes	Yes	Yes	Good
<b>Symon 2000, UK and Scotland†</b>	Yes	Yes	Yes	Yes	Yes	Yes	Fair	N/A	Yes	Yes	Fair
<b>Vimercati et al. 2000, Italy</b>	Yes	Yes	Yes	N/A	Yes	Yes	Good	Yes	Yes	Yes	Good
<b>Passmore et al. 2002, England</b>	Yes	Yes	Yes	Yes	Yes	Yes	Fair	N/A	Yes	Yes	Fair
<b>Brilla et al. 2006, Germany and USA</b>	Yes	Yes	Yes	Yes	Yes	Yes	Good	Yes	Yes	Yes	Good
<b>Catino et al. 2009, Italy</b>	Yes	Yes	Yes	N/A	Yes	Yes	Good	N/A	Yes	Yes	Fair
<b>Steurer et al. 2009, Switzerland</b>	Yes	Yes	N/A	N/A	N/A	Yes	Poor	Yes	Yes	Yes	Good
<b>Feess 2012, Germany‡</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Rohacek et al. 2012, Switzerland</b>	Yes	Yes	Yes	Yes	Yes	Yes	Good	Yes	Yes	Yes	Good
<b>Elli et al. 2013, Italy</b>	Yes	Yes	No	N/A	Yes	Yes	Fair	No	Yes	Yes	Poor
<b>Ortashi et al. 2013, UK</b>	Yes	Yes	No	Yes	Yes	Yes	Good	Yes	Yes	Yes	Fair
<b>Domingues et al. 2014, Portugal</b>	Yes	Yes	Yes	Yes	Yes	Yes	Fair	Yes	Yes	Yes	Fair
<b>Garcia-Retamero et al. 2014, Spain</b>	Yes	Yes	Yes	Yes	Yes	Yes	Good	Yes	Yes	Yes	Good
<b>Solaroglu et al. 2014, Turkey</b>	Yes	Yes	Yes	Yes	Yes	Yes	Good	N/A	Yes	Yes	Good
<b>Bourne et al. 2015, UK</b>	Yes	Yes	Yes	Yes	Yes	Yes	Good	Yes	Yes	Yes	Good



<b>Motta et al. 2015, Italy</b>	Yes	Yes	Yes	Yes	Yes	Yes	Good	Yes	Yes	Yes	Good
<b>Osti et al. 2015, Austria</b>	Yes	Yes	Yes	Yes	Yes	Yes	Good	Yes	Yes	Yes	Good
<b>Ramella et al. 2015, Italy</b>	Yes	Yes	Yes	Yes	Yes	Yes	Good	Yes	Yes	Yes	Good
<b>Tanriverdi et al. 2015, Turkey</b>	Yes	Yes	Yes	Yes	Yes	Yes	Good	Yes	Yes	Yes	Good
<b>Antoci et al. 2016, Italy†</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Panella et al. 2016, Italy</b>	Yes	Yes	Yes	Yes	Yes	Yes	Good	Yes	Yes	Yes	Good
<b>Bourne et al. 2017, UK</b>	Yes	Yes	Yes	Yes	Yes	Yes	Good	Yes	Yes	Yes	Good
<b>Olçay et al. 2017, Turkey</b>	Yes	Yes	No	Yes	Yes	Yes	Good	Yes	No	No	Fair
<b>Panella et al. 2017, Italy</b>	Yes	Yes	Yes	Yes	Yes	Yes	Good	Yes	Yes	Yes	Good
<b>Vandersteegen et al. 2017, Belgium</b>	Yes	Yes	Yes	Yes	Yes	Yes	Fair	Yes	Yes	Yes	Good
<b>Yan et al. 2017, The Netherlands</b>	Yes	Yes	No	Yes	Yes	No	Good	Yes	Yes	No	Fair
<b>Kucuk 2018, Turkey</b>	Yes	Yes	Yes	Yes	No	Yes	Good	N/A	Yes	Yes	Good
<b>Mira et al. 2018, Spain</b>	Yes	Yes	Yes	Yes	Yes	Yes	Good	Yes	Yes	Yes	Good
<b>Tebano et al. 2018, 74 countries</b>	Yes	Yes	Yes	N/A	Yes	Yes	Good	Yes	Yes	Yes	Fair
<b>Bourne et al. 2019, UK</b>	Yes	Yes	Yes	Yes	Yes	Yes	Good	Yes	Yes	Yes	Good
<b>Laarman et al. 2019, The Netherlands</b>	Yes	Yes	Yes	Yes	Yes	Yes	Good	Yes	Yes	Yes	Good
<b>Aranaz Andrés et al. 2020, Spain</b>	Yes	Yes	Yes	Yes	Yes	Yes	Good	Yes	Yes	Yes	Good
<b>Calikoglu et al. 2020, Turkey</b>	Yes	Yes	Yes	Yes	Yes	Yes	Good	Yes	Yes	Yes	Good
<b>Ferorelli et al. 2020, Italy</b>	Yes	Yes	Yes	Yes	Yes	Yes	Fair	Yes	Yes	Yes	Good
<b>Gadjradj et al. 2020, Europe and other</b>	Yes	Yes	Yes	Yes	Yes	Yes	Good	Yes	Yes	Yes	Good

<b>Osorio et al. 2020, Spain</b>	Yes	Yes	Yes	Yes	Yes	No	Fair	Yes	Yes	Yes	Fair
<b>Pausch et al. 2020, Germany</b>	Yes	Yes	Yes	Yes	Yes	Yes	Good	Yes	Yes	Yes	Good
<b>Vargas-Blasco et al. 2020, Spain</b>	Yes	Yes	N/A	N/A	Yes	Yes	Good	N/A	Yes	Yes	Fair
<b>Vizcaino-Rakosnik et al. 2020, Spain</b>	Yes	Yes	Yes	No	Yes	Yes	Good	Yes	Yes	Yes	Good

N/A: not available

\*Symon 2000, UK and Scotland, Litigation and changes in professional behaviour: a qualitative appraisal



†Symon 2000, UK and Scotland, Litigation and defensive clinical practice: quantifying the problem

‡CASP or CSAT are non-applicable

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## Protocol

# BMJ Open How defensive medicine is defined and understood in European medical literature: protocol for a systematic review

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## ABSTRACT

**Introduction** The term defensive medicine, referring to actions motivated primarily by litigious concerns, originates from the USA and has been used in medical research literature since the late 1960s. Differences in medical legal systems between the US and most European countries with no tort legislation raise the question whether the US definition of defensive medicine holds true in Europe.

**Aim** To present the protocol of a systematic review investigating variations in definitions and understandings of the term 'defensive medicine' in European research articles.

**Methods and analysis** In concordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines, a systematic review of all medical research literature that investigate defensive medicine will be performed by two independent reviewers. The databases PubMed, Embase and Cochrane will be systematically searched on the basis of predetermined criteria. Data from all included European studies will systematically be extracted including the studies' definitions and understandings of defensive medicine, especially the motives for doing medical actions that the study regards as 'defensive'.

**Ethics and dissemination** No ethics clearance is required as no primary data will be collected. The results of the systematic review will be published in a peer-reviewed, international journal.

**PROSPERO registration number** This review has been submitted to International Prospective Register of Systematic Reviews (PROSPERO) and is awaiting registration.

## INTRODUCTION

### Background

Defensive medicine (DM) is a term that has been used in the medical research literature since the late 1960s.<sup>1</sup> The term originates from the US<sup>2</sup> and has since then taken on various connotations.<sup>3</sup> The most commonly used definition describes DM as 'physicians' deviations from sound medical practice due to fear of liability claims and lawsuits'.<sup>4-8</sup> DM

## Strengths and limitations of this study

- The present systematic review will be based on a systematic and thorough search of literature independently performed by two reviewers concordant with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines, hereby increasing the generalisability and reliability of the findings.
- The scientific quality of each reviewed study will be assessed by use of standardised quality assessment tools and only the content of peer-reviewed original research papers will be included in the analysis.
- Only English language studies will be included in the systematic review.

can additionally be subdivided into two main forms of behaviour: (1) positive DM (also labelled active DM or assurance behaviour), which involves physicians ordering extra diagnostic tests, procedures or visits and (2) negative DM (also labelled passive DM or avoidance behaviour) which is the avoidance of high-risk patients or procedures. Both forms aim to reduce physicians' exposure to malpractice liability.<sup>4-7</sup> The above definition of DM consists of two components: A medical action and an underlying motive for acting defensively.

DM has been associated with rising health-care costs.<sup>7</sup> Furthermore, it has been associated with overtreatment, overprescription and overdiagnosing of patients and decreased trust in the physician–patient relationship, leading patients to mistrust physicians' motivations and physicians to regard patients as potential plaintiffs.<sup>7-12</sup> Moreover, physicians report patient disrespect for their professionalism, personal frustration and inequality in healthcare as possible consequences of DM.<sup>13,14</sup>

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In the USA, DM is reported to be frequent.<sup>15</sup> The number of lawsuits for medical malpractice has risen significantly,<sup>9</sup> and DM has been shown to be directly related to this growth.<sup>12</sup> US physicians are forced to hold expensive malpractice insurances in order to cover the cost from malpractice suits.<sup>16</sup> Hence, with inadequate legislation protecting physicians from tort, concerns about malpractice liability is likely to be the predominant reason to act defensively.<sup>7</sup> Indeed, negative associations have been found between physicians' use of medical resources and risk of malpractice claims.<sup>17</sup>

In several European countries malpractice litigation is reported to happen less frequently than in the USA, for example in The Netherlands,<sup>2,18</sup> Denmark,<sup>13</sup> Switzerland<sup>19</sup> and the UK.<sup>20</sup> In these countries, the medicolegal system does not hold physicians financially liable for malpractice or other treatment related adverse events. The patients are instead compensated by the government (known as a no-fault system).<sup>21–23</sup> Nevertheless, DM seems also to be prevalent in Europe, for example Denmark,<sup>13</sup> the UK,<sup>24</sup> Italy,<sup>12</sup> Belgium,<sup>25</sup> The Netherlands,<sup>2</sup> Germany<sup>26</sup> and Switzerland.<sup>20</sup> Furthermore, a substantial part of research on DM seems to originate from Europe.

Variations in medicolegal systems between the US and most European countries raise the question whether the definition of DM, as actions motivated primarily by litigious concerns, holds true in European countries where physicians are not subjected to tort legislation<sup>20</sup> and if other motives for performing defensive medical actions are documented in the European literature on DM.<sup>27</sup>

## Rationale

Science needs definitions. To our knowledge no systematic review exists of how DM is defined and understood in the European scientific, medical literature. A systematic review of the term 'defensive medicine' in the European context will provide a more nuanced understanding of this complex and non-beneficial phenomenon, hereby supporting the quality of future research on the topic.

## Objectives

The aim of this study is to present a protocol paper for a systematic review with the following objective: To analyse variations in the definitions and understandings of the term 'defensive medicine' in European research articles.

## METHODS

### Patient and public involvement

Patients or the public were not involved in the design, or conduct, or reporting, or dissemination of our research.

### Protocol

This protocol for a systematic review is conducted in concordance with the PRISMA Protocol.<sup>28</sup>

### Eligibility criteria

Publications will be included in the review based on the following criteria.

### Inclusion criteria

1. One or both of the terms 'defensive medicine' and 'defensive practice' are stated in title or abstract.
  2. The study is available in full text and written in English language.
  3. DM is performed by physicians, including general practitioners, as well as physicians from medical, surgical and paraclinical specialities.
  4. The study is an original research study (quantitative or qualitative primary research) or systematic review published in a peer-reviewed, medical journal.
  5. DM is stated as part of the study's aim/objective in at least one of the following ways:
    - a. DM is included in the publication's aim/objective.
    - b. DM is implicitly a significant part of the aim/objective.
- Further
6. The study's research data includes data from Europe.

### Information sources

Eligible studies will be searched in three databases: PubMed, Embase and Cochrane from conception to February 3rd 2020.

### Search strategy

The preparation of search strategy is based on the original American term 'defensive medicine'. In accordance with the database PubMed, the MeSH term 'defensive medicine' is combined with the entry terms 'defensive practice', 'defensive practices' and 'medicine, defensive'. On the basis of this, the following search strategy will be used: 'defensive medicine OR defensive practice OR defensive practices OR medicine, defensive'. All references in the papers fulfilling the inclusion criteria will be examined in order to identify potentially neglected studies. The literature search will be updated before the final analysis. See online supplementary appendix for detailed search strategy.

### Study records

#### Data management

Publications found by the search strategy will be exported into the reference management software (EndNote)<sup>29</sup> and the software Covidence,<sup>30</sup> where the systematic screening and data extraction will be performed, including the removing of duplicates. Number of citations for each study will be assessed with Web of Science<sup>31</sup> in concordance with the PRISMA guidelines.<sup>28</sup>

### Selection process

Two independent reviewers (NB and PS) will screen all potentially relevant studies in a two-phase screening process to ensure interrater reliability, compliance with the inclusion criteria and eligibility by use of Covidence.<sup>30</sup> NB and PS will discuss and resolve any disagreements to reach consensus. If consensus is not achievable, a third reviewer (JL) will be involved in the discussion and finally decide whether the study in question is to be included or not.



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### Data collection process

The primary authors (NB and PS) will extract data from the included studies, including publication details (author(s), name of journal, year of publication), study characteristics (design, country of origin, sample size, medical specialty investigated and number of citations), study objective, stated definitions of DM and understandings of DM.

### Quality assessment

The two reviewers (NB and PS) will independently assess the quality of each study. The qualitative studies will be reviewed using the Critical Appraisal Skills Programme,<sup>32</sup> recommended by the Centre for Clinical Guidelines (CFKR),<sup>33</sup> to ensure a critical and standardised assessment of the quality and analysis of the study. The quantitative studies will be reviewed using a cross-sectional appraisal tool with questions adapted from Guyatt *et al.* JAMA 1993 and 1994.<sup>34 35</sup> The systematic reviews will be reviewed using Assessing the Methodological Quality of Systematic Reviews<sup>36</sup> recommended by the CFKR.<sup>33</sup> Disagreements will be discussed until consensus is reached.

### Data items

Data items are as stated above under 'methods'. The design of the review is based on the hypothesis that a definition of DM reflects the medicolegal system in which it is used. Therefore, we expect the definitions and understandings of DM stated in the European research literature to be different than those stated in the literature deriving from the USA.

### Data synthesis

For each paper, the stated definition and understanding of DM will be extracted by the first author (NB). The definition of DM will be identified as: 'DM is...', 'DM is defined as...', 'DM refers to...', or 'DM is characterised by...'. If no definition of DM is stated, the way in which DM is introduced will be identified. A paper's understanding of DM is assessed from its use in the study and may differ from the stated definition. Quotes identifying how DM is understood will be extracted and analysed according to a thematic analysis approach aiming to categorise the different understandings. Based on the above definitions of DM, it is expected that the vast majority of papers will define DM as healthcare actions conducted by healthcare professionals during their work, but that the motives making the actions defensive may differ between papers showing a broader understanding of DM in some European studies than according to the US definition. Thus, for each paper, the motives regarded as defensive will be identified in the texts, tables, figures, as well as in the data collection methods. The identified categories of DM definitions and understandings will be scrutinised by the author group.

### Outcomes and prioritisation

The review's main outcomes will be a categorisation of the identified definitions of DM in the European medical

research literature focusing on the motives for medical acting that the studies regard as defensive and a graphical display of the historical trend in the annual number of published European original research papers regarding DM divided on the identified categories of DM definitions. The review will report if any differences in the definitions and understandings of DM between countries and between high-quality and low-quality papers exist.

### Risk of bias in individual studies

Since the objective of this study differs from most systematic reviews by not taking interest in the results found by the reviewed studies, the quality assessment of the identified papers serves a different purpose. The assessment of the quality of the papers is used to show whether high quality papers use a different definition of DM than other papers (see the above-described quality assessment procedure).

Although there are multiple languages used in Europe, the review only includes English scientific literature. However, most high-ranking scientific journals reporting on DM is written in English and we specifically aim to support future research on DM. Furthermore, DM was originally conceptualised in English.

### CONCLUSION

This systematic review will address the variations in the definitions and understandings of the term 'defensive medicine' in European research articles. This review seeks to provide a more nuanced understanding of the complex and non-beneficial phenomenon of DM, hereby supporting the quality of future research on the topic.

### Potential amendments

We do not envisage any amendments to the present protocol. However, should an amendment be necessary, it will be notified, registered and reported.

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**Contributors** NB contributes to conceptualisation, protocol design, development of search strategy, study inclusion, data extraction, quality assessment, data analysis/synthesis, drafting and writing of protocol and manuscript. PS contributes to conceptualisation, development of search strategy, study inclusion, data extraction, quality assessment, data analysis/synthesis, drafting and writing of manuscript. EAH contributes to conceptualisation, protocol design, writing of protocol and manuscript. HG contributes to conceptualisation, protocol design, writing of manuscript. MKA contributes to conceptualisation, protocol design, writing of manuscript. JL contributes to conceptualisation, protocol design, study inclusion, writing of protocol and manuscript.

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