Psychological and Psychosomatic Symptoms of Second Victims of Adverse Events: a Systematic Review and Meta-Analysis

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Recent decades have been characterized by improvements and innovations in medicine, as well as the progressively increasing use of health information technology as well as specialization and subspecialization of healthcare providers.1–3 Because in part of the rise of technology and fragmentation of care, the human aspects of clinical practice are undervalued for both patients and providers. Although patients’ emotions and individual needs as human beings have long been underappreciated,4,5 healthcare providers now face unprecedented time pressures and performance accountability in highly complex environments.6,7

There is a high expectation of perfection in medicine, and medical errors are often viewed as a personal failure of the healthcare providers involved.5,8 However, research has shown that unsafe acts are rarely isolated from their system context.9 Usually, it is a cluster of active failures and latent systemic conditions that causes a patient safety incident (i.e., adverse events harming or potentially harming a patient),10 as illustrated in Reason’s Swiss Cheese Model.11 Although patient safety incidents are common (i.e., between 4% and 17% of hospitals admissions are linked to adverse events),11 they are still stigmatized, with a strong negative impact for physicians.12,13 Historically, it has been overlooked that adverse events affect not only the patient as first victim but also are also highly stressful for the involved providers, thus commonly considered as second victims.8 Although there has been recent controversy over use of the term second victim, an alternative, more appropriate term has not been established.14,15 Second victims often feel responsible for the adverse event and may doubt their professional skills and knowledge,16 experience psychological and psychosomatic symptoms and may consider career changes,17 take sick leave,18 transition to a different department,19 or even leave their profession after.20 Quillivan et al.21 pointed out that the second-victim experience may incite a vicious cycle, leading to further medical errors and affecting patient safety.

There has been growing interest in the second-victim phenomenon,22 with more research on the topic, greater awareness of its negative impact on healthcare,23,24 and successful implementation of psychosocial support programs especially in the United States (e.g., RISE – Resilience in Stressful Events, Johns Hopkins Hospital, Maryland25, forYou, University of Missouri Health Care, Columbia, Missouri26; Medically Induced Trauma Support Services, Chestnut Hill, Massachusetts27). To gain further knowledge about second victims and to reduce the punitive culture still existing in many countries,26 several systematic reviews have been conducted.27–29 However, there has not been a meta-analysis quantifying the psychological impact of adverse events on second victims. To fill this gap, we aimed to provide a comprehensive synthesis and critical analysis of second victims’ emotional distress.

METHODS

The protocol of the study is registered in the International Prospective Register of Systematic Reviews (PROSPERO), Registration Number CRD42016053239.

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**Recent decades have been characterized by improvements and innovations in medicine, as well as the progressively increasing use of health information technology as well as specialization and subspecialization of healthcare providers.**1–3 **Because in part** **of the rise of technology and fragmentation of care, the human aspects of clinical practice are undervalued for both patients and providers. Although patients’ emotions and individual needs as human beings have long been underappreciated,4,5 healthcare providers now face unprecedented time pressures and performance accountability in highly complex environments.**6,7

**There is a high expectation of perfection in medicine, and medical errors are often viewed as a personal failure of the healthcare providers involved.5,8 However, research has shown that unsafe acts are rarely isolated from their system context.9 Usually, it is a cluster of active failures and latent systemic conditions that causes a patient safety incident (i.e., adverse events harming or potentially harming a patient),10 as illustrated in Reason’s Swiss Cheese Model.11 Although patient safety incidents are common (i.e., between 4% and 17% of hospitals admissions are linked to adverse events),11 they are still stigmatized, with a strong negative impact for physicians.12,13 Historically, it has been overlooked that adverse events affect not only the patient as first victim but also are also highly stressful for the involved providers, thus commonly considered as second victims.8 Although there has been recent controversy over use of the term second victim, an alternative, more appropriate term has not been established.14,15 Second victims often feel responsible for the adverse event and may doubt their professional skills and knowledge,16 experience psychological and psychosomatic symptoms and may consider career changes,17 take sick leave,18 transition to a different department,19 or even leave their profession after.20 Quillivan et al.21 pointed out that the second-victim experience may incite a vicious cycle, leading to further medical errors and affecting patient safety.

**There has been growing interest in the second-victim phenomenon,22 with more research on the topic, greater awareness of its negative impact on healthcare,23,24 and successful implementation of psychosocial support programs especially in the United States (e.g., RISE – Resilience in Stressful Events, Johns Hopkins Hospital, Maryland25, forYou, University of Missouri Health Care, Columbia, Missouri26; Medically Induced Trauma Support Services, Chestnut Hill, Massachusetts27). To gain further knowledge about second victims and to reduce the punitive culture still existing in many countries,26 several systematic reviews have been conducted.27–29 However, there has not been a meta-analysis quantifying the psychological impact of adverse events on second victims. To fill this gap, we aimed to provide a comprehensive synthesis and critical analysis of second victims’ emotional distress.**

**METHODS**

The protocol of the study is registered in the International Prospective Register of Systematic Reviews (PROSPERO), Registration Number CRD42016053239.
Search and Selection Process
A systematic search of nine electronic databases (i.e., PubMed, Cochrane Library, Web of Science, Scopus, PsycINFO, EMBASE, ScienceDirect, MEDLINE, CINAHL) was conducted up to February 2017, without restrictions to publication date and language, using the following search strategy: (medical error OR patient safety incident OR adverse event OR near miss OR human error) AND (health personnel OR second victim OR health professional OR health care provider) AND (psychological impact OR experience* OR psychological response OR psychological symptom OR feeling OR emotion* OR mental health OR cognit* OR psychosomatic symptom OR coping OR resilience OR peer support OR team building). A detailed record of the applied search strategy for each database is provided in Supplemental Data File 1, http://links.lww.com/JPS/A227.

To identify additional studies, we screened databases of gray literature (e.g., PsycEXTRA), volumes of journals, reference lists of books, book chapters, systematic reviews, and white papers (see Supplemental Data File 2, http://links.lww.com/JPS/A227 for a comprehensive overview of the additional searches). Furthermore, to detect newly published, potentially eligible articles, automatic, weekly e-mailed search alerts were set up for the databases Web of Science and PubMed for February 12, 2017, to April 15, 2018.

Studies were eligible for inclusion if (a) the participants were healthcare providers involved in adverse events/patient safety incidents (i.e., harmful incidents, near misses, and no-harm incidents), as defined by the Canadian Patient Safety Institute,10 and (b) the prevalence of psychological and psychosomatic symptoms in this population was reported. There were no restrictions on age, sex, healthcare profession, and setting (i.e., inpatient or outpatient care).

Editorials, general discussion papers, comments, letters, book chapters, systematic reviews, single case studies, case series, and qualitative studies were excluded because we did not expect original, quantitative findings (i.e., prevalence rates of psychological or psychosomatic symptoms of healthcare providers involved in adverse events) to be reported in these types of articles.

Two independent reviewers (I.M.B. and F.M.) screened titles and abstracts of the records using Rayyan, a Systematic Reviews Web application.11 The full texts of records considered as eligible by at least one of the two reviewers were then independently evaluated. In cases of dissent about the inclusion of the full texts, the appropriateness of the inclusion/exclusion was debated and a third reviewer (M.R.) was involved. As suggested in the Cochrane Handbook,29 all the excluded studies and the reasons for exclusion were recorded.

The entire search and selection process have been recorded according to the Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement by Moher et al.32

Quality Assessment
The quality of the included studies was assessed by two appraisers (I.M.B. and F.M.), independently and then by consensus, using the Joanna Briggs Institute Critical Appraisal Checklist for Studies Reporting Prevalence Data,33 a standardized tool based on nine quality criteria (i.e., appropriate sample frame to address target population, appropriate method of recruitment, adequate sample size, detailed description of study subjects and setting, data analysis with sufficient coverage of the identified sample, use of valid methods to identify the condition, measurement of condition in a standard and reliable way, appropriate statistical analysis, adequate response rate/appropriate management of low response rate) that can be scored as yes (i.e., met criterion), no (i.e., unmet criterion), unclear, and not applicable. Disagreements were discussed and resolved, involving a third appraiser (M.R.) to adjudicate.

Outcome Measure
The primary outcome measure was the prevalence of psychological (i.e., at the emotional and cognitive level, such as guilt and difficulty concentrating) and psychosomatic symptoms (e.g., sleep disturbance) among healthcare providers involved in an adverse event.

Data Extraction and Synthesis
Two investigators (I.M.B. and F.M.) independently collected study characteristics (e.g., publication year, country, study design, setting, sample size of the participants involved in an adverse event, type of adverse event, patient’s outcome) and outcome measures, using a data collection form.

Cases of dissent were discussed and, if necessary, a third investigator (M.R.) was involved to reach consensus. If missing data were identified, the authors of the primary study were contacted.

Aiming to synthesize the extracted findings, we applied the following rules:
1. If symptoms were expressed only as percentages, without any absolute frequency (required for the applied software Comprehensive Meta-Analysis V [Biostat Inc, Englewood, NJ]), we calculated frequency by converting the percentage to a decimal and then by multiplying the decimal by the sample size. If then the calculated absolute frequency included decimals, we rounded it according to standard rules.
2. To calculate the overall prevalence of psychological and psychosomatic symptoms, we grouped the variables of interest, retrieved from the primary studies, that corresponded in terms of content and wording. If variables of interest were similar thematically but differed from each other in terms of wording (e.g., fear of repeating the mistake,34 anxiety about the potential for future errors,35 anxious about potential for future errors),36 we considered them as a single group (see Supplemental Data File 3, http://links.lww.com/JPS/A227 for a comprehensive list of all groups of variables of interest included in the meta-analyses).
3. If more than one variable of interest, extracted from the same paper and thus based on the same sample, would have potentially fit into the same group, we selected—aiming to prevent overlap—the variable that was most appropriate in terms of content and wording (e.g., the variable of interest anxiety37 was considered more appropriate than panic/worries37 for the group “anxiety”).

Meta-analyses
Because we expected considerable heterogeneity across studies due to several factors, such as a variety of applied instruments, participants’ professions, and medical settings, we used random effects modeling for all analyses. We (M.P. and C.B.) calculated the overall prevalence (i.e., average effect size) of psychological and psychosomatic symptoms with 95% confidence interval (CI) by pooling the individual prevalence rates (i.e., individual effect sizes) of at least two primary studies. Regarding the investigation of statistical heterogeneity, we visually assessed forest plots, calculated and interpreted the I² statistic as recommended in the Cochrane Handbook38: I² estimates might not be important from 0% to 40%, may represent moderate heterogeneity from 30% to 60%, substantial heterogeneity from 50% to 90%, and considerable heterogeneity from 75% to 100%. The meta-analyses were performed using Comprehensive Meta-Analysis V3 (Biostat Inc, Englewood, NJ).

RESULTS
Selection and Inclusion of Studies
The search of the electronic databases (see Supplemental Data File 1, http://links.lww.com/JPS/A227) and additional sources
(i.e., databases of gray literature, volumes of journals, reference lists of books, book chapters, systematic reviews, and white papers) (see Supplemental Data File 2, http://links.lww.com/JPS/A227) initially produced 7210 records (7195 and 15 records, respectively). After screening title and/or abstract, 98 full-text articles were assessed for eligibility. Eighty studies were then excluded for various reasons such as mismatch with the inclusion criteria, mixed population, wrong focus of the study, or insufficient information (see Supplemental Data File 4, http://links.lww.com/JPS/A227 for a comprehensive overview of the excluded studies). Finally, 18 studies, all meeting the inclusion criteria, were included (Fig. 1).

Quality Assessment
All primary studies met more than half of the quality criteria (i.e., between 5 and 8) of the Joanna Briggs Institute Critical Appraisal Checklist for Prevalence Studies. All studies used an appropriate sample frame to address the target population, analyzed the data with sufficient coverage of the identified sample, and measured the conditions in a standard, reliable way. However, the adequacy of the sample size and the use of valid methods remained unclear for several studies; others did not recruit the participants appropriately or did not describe the characteristics of the participants and the setting in sufficient detail. In some articles, the statistical analyses were not entirely appropriate (e.g., prevalence rates expressed only by percentages). A detailed overview of appraisers’ judgments of each included primary study is given in Supplemental Data File 5, http://links.lww.com/JPS/A227.

Characteristics of the Included Studies
The 18 included primary studies (Table 1), all written in English except for one in German, were published between 1991 and 2016. Six were conducted in the United States, two in the United Kingdom, and one study each in Australia, Canada, Greece, Iran, Denmark, Sweden, Germany, Switzerland, and Turkey. One study was conducted both in Canada and in the United States. Aside from O’Beirne et al. who collected patient safety incident records for 3 years, all other studies applied a cross-sectional survey design. Although some authors calculated only descriptive statistics, others additionally applied inferential statistics (e.g., correlation or regression analyses). All authors used paper-and-pencil or web-based/electronic self-report questionnaires with predominantly closed-ended questions. Schroder et al. additionally conducted semistructured interviews; however, we included only the quantitative data reported by Schroder et al. in our study. Many authors created also own questionnaires or adapted already existing ones, such as the one developed and validated by Wu et al. or Waterman et al. Well-established clinical questionnaires, such as the PTSD Symptom Scale Self-Report version and the Primary Care Evaluation of Mental Disorders, were also used. The selected studies investigated participants with various occupational roles (e.g., nurses, midwives, physicians), working both in inpatient and outpatient care in different medical settings (e.g., surgery, obstetrics, internal medicine). The sample size of the respondents/healthcare providers involved in an adverse event ranged from 4041 to 2909, reaching a total of 11,649 participants. Seven studies provided information about the time of occurrence of the adverse event: some reported a long time frame (e.g., at any point

FIGURE 1. The PRISMA flow diagram.
| Authors          | Year | Country  | Study Design                                                                 | Setting (Inpatient Versus Outpatient) | Participants’ Profession | Sample Size of Healthcare Providers Involved in an Adverse Event | Point in Time of Adverse Event | Type of Adverse Event | Categorization of Adverse Event Severity | Patient Outcomes |
|------------------|------|----------|-------------------------------------------------------------------------------|---------------------------------------|--------------------------|-----------------------------------------------------------------|-------------------------------|---------------------|----------------------------------------|------------------|
| Cebeci et al.37  | 2015 | Turkey   | Cross-sectional study design applying descriptive and inferential statistics; self-report questionnaire (developed by the research team; not specified if paper-and-pencil or web-based; closed- and open-ended questions) | Inpatient care                       | Nursing students         | 124                                                             | Not specified              | Medication errors | Medication Administration Errors by MEDMARX Category*: no error (defined as Circumstances or events that have the capacity to cause error), error, no harm, error, harm | Not specified |
| Chard39          | 2010 | United States | Cross-sectional study design applying descriptive and inferential statistics; paper-and-pencil, self-report “Perioperative Nurse Questionnaire” (developed by the author; closed-ended questions) | Inpatient care                       | Perioperative nurses     | 158                                                             | Most errors occurred more than 4 y before the time of the study | Intraoperative nursing errors (e.g., unclear about surgical site, break in sterile technique) | Not specified |
| Cramer et al.34  | 2012 | Germany  | Cross-sectional study design applying descriptive and inferential statistics; paper-and-pencil, self-report questionnaire (developed by the research team; closed- and open-ended questions) | Inpatient care                       | Nurses, nursing auxiliaries (also in pediatric and geriatric care) working in different hospitals and nursing homes | 1100                                                             | Not specified              | Nursing errors (not further specified) | Not specified |
| Study                         | Year | Country        | Study Design                        | Sample Size | Event Types                                                                 |
|-------------------------------|------|----------------|-------------------------------------|-------------|-----------------------------------------------------------------------------|
| Dhillon et al.40              | 2015 | United States  | Cross-sectional study design        | 245         | Perioperative errors (e.g., drug error)                                    |
|                               |      |                | applying descriptive and inferential statistics; web-based, self-report questionnaire (developed by the research team; closed- and open-ended questions) |            |                                                                             |
| Harrison et al.36             | 2014 | United Kingdom | Cross-sectional study design        | 1463        | Adverse event with serious patient harm, adverse event with minor patient harm, near miss with potential for serious patient harm, near miss with potential for minor patient harm, none of these |
|                               |      |                | applying descriptive statistics; web-based, self-report questionnaire (modified version of the questionnaire used by Waterman et al.35; closed-ended questions) |            |                                                                             |
| Hobgood et al.41              | 2005 | United States  | Cross-sectional study design        | 40          | Patient safety event with actual adverse outcome, near miss                |
|                               |      |                | applying descriptive and inferential statistics; paper-and-pencil, self-report questionnaire (developed by the research team; closed-and open-ended questions) |            |                                                                             |
| Joesten et al.42              | 2015 | United States  | Cross-sectional study design        | 120         | Patient safety event with actual adverse outcome, near miss                |
|                               |      |                | applying descriptive statistics; web-based, modified version of the self-report “Medically Induced Trauma Support Services Staff Support Survey” (closed-ended questions) |            |                                                                             |

(Continued next page)
| Authors         | Year | Country | Study Design                                                                 | Setting (Inpatient Versus Outpatient) | Participants’ Profession                                                                 | Sample Size of Healthcare Providers Involved in an Adverse Event | Point in Time of Adverse Event | Type of Adverse Event                                                                 | Categorization of Adverse Event Severity | Patient Outcomes                                                                 |
|-----------------|------|---------|-------------------------------------------------------------------------------|---------------------------------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------|-------------------------------------------|----------------------------------------------------------------------------------|
| Karga et al.    | 2011 | Greece  | Cross-sectional study design applying descriptive and inferential statistics; paper-and-pencil, self-report questionnaire (modified version of the questionnaire by Wu et al.44 (1991) and Meurier et al.45 (1997), respectively; closed- and open-ended questions) | Inpatient care                       | Nurses working in different hospital departments (e.g., hemodialysis, surgery, intensive care) | 536                                                                | At any point in the entire career                                         | Medication errors, errors linked to hemodialysis practices, surgical practices, or other tasks (e.g., documentation and blood transfusion) | Perceived error severity (high, medium, low, none)                                  | Patient death, prolonged hospital stay, need for additional therapeutic interventions and monitoring |
| Leinweber et al.| 2017 | Australia | Cross-sectional study design applying descriptive and inferential statistics; web-based, self-report questionnaires (inter alia “Traumatic Events in Perinatal Care List”, “PTSD Symptom Scale Self-Report version”; closed-ended questions) | Inpatient and outpatient care          | Midwives (members of Australian College of Midwives)                                         | 687                                                                | Not specified                                                | Noninterpersonal birth trauma (death and injury of mother and infant), interpersonal birth trauma (abusive care or management, poor care, interpersonal disrespect) | Not specified                                                                   | e.g., death and injury of mother and infant                                      |
| McLennan et al. | 2015 | Switzerland | Cross-sectional study design applying descriptive and inferential statistics; web-based, self-report questionnaire (modified version of questionnaire by Waterman et al.35 (2007); closed-ended questions) | Inpatient care                       | Anesthesiologists                                                                           | 281                                                                | Not specified                                                | Not specified                                               | Serious error, minor error, near miss                                                | Not specified                                                                                     |
| Study | Year | Location | Study Type | Population | Sample Size | Type of Event | Event Severity | Event Description |
|-------|------|----------|------------|------------|-------------|---------------|----------------|-------------------|
| Meurier et al. | 1997 | United Kingdom | Cross-sectional study design applying descriptive and inferential statistics; paper-and-pencil, self-report questionnaire (modified version of the questionnaire by Wu et al. (1991); closed- and open-ended questions) | Inpatient care | Nurses working on different wards in a district general hospital | 129 | Not specified | Errors related to communication, assessment, planning, intervention and evaluation | Severe effects, moderate effects, mild effects, no consequences |
| O’Beirne et al. | 2012 | Canada | Analysis of two questions from confidential patient safety incident reports collected from September 2007 to August 2010; application of descriptive and inferential statistics | Outpatient care | Physicians, clinic staff (nurses, office staff, managers) in family medicine | 238 | Not specified | Adverse events related to documentation, medication, clinical process | Severity of incident (fatal, severe, moderate, mild, none, not sure) |
| Schröder et al. | 2016 | Denmark | Cross-sectional mixed-method study design (i.e., data generated from a national survey and a qualitative interview study) applying descriptive statistics; self-report questionnaire with closed-ended questions an semistructured interviews (developed by the research team) | Not specified | Obstetricians, midwives (members of the Danish Medical Association and the Danish Association of Midwives) | 1027* | At any point in the entire career | Traumatic childbirth | Not specified | Fatal, permanent, and severe injuries for infant or mother |

(Continued next page)
| Authors | Year | Country | Study Design | Setting (Inpatient Versus Outpatient) | Participants’ Profession | Sample Size of Healthcare Providers Involved in an Adverse Event | Point in Time of Adverse Event | Type of Adverse Event | Categorization of Adverse Event Severity | Patient Outcomes |
|---------|------|---------|--------------|---------------------------------------|--------------------------|---------------------------------------------------------------|-------------------------------|---------------------|----------------------------------------|-----------------|
| Shanafelt et al. | 2010 | United States | Cross-sectional study design, applying descriptive and inferential statistics; electronic, self-report questionnaires (inter alia “Maslach Burnout Inventory,” “Primary Care Evaluation of Mental Disorders,” “Medical Outcomes Study Short Form”; closed-ended questions) | Not specified | Surgeons (members of the American College of Surgeons) | 700 | Within the previous 3 mo | Not specified | Not specified | Not specified |
| Taifoori and Valiie | 2015 | Iran | Cross-sectional study design applying descriptive statistics; paper-and-pencil, self-report questionnaire (“Perioperative Nurse Questionnaire”; closed-ended questions) | Inpatient care | Perioperative nurses | 153 | Not specified | Perioperative errors (e.g., not following sterile technique, incorrect counts of surgical gauze, incorrect counts of surgical tools, leaving a foreign body in the patient) | Not specified | Not specified |
| Wahlberg et al. | 2016 | Sweden | Cross-sectional study design applying descriptive and inferential statistics; web-based, self-report questionnaire (inter alia modified version of the “Screen Questionnaire Posttraumatic Stress Disorder”; closed-ended questions) | Not specified | Obstetricians, midwives (members of the Swedish Society of Obstetrics and Gynecology and the Swedish Association of Midwives) | 1628 | Not specified | Traumatic childbirth (e.g., death or severe injury of the child during delivery, maternal near-miss, maternal mortality, violence, threat) | Not specified | Not specified |
| Study | Year | Country | Study Design | Setting | Sample Size | Time Frame | Outcomes | Error Categories |
|-------|------|---------|--------------|---------|-------------|------------|----------|----------------|
| Waterman et al. | 2007 | Canada/United States | Cross-sectional study design applying descriptive and inferential statistics; paper-and-pencil or web-based, self-report questionnaire (developed by the research team; closed-ended questions) | Inpatient and outpatient care | Physicians in internal medicine, surgery, pediatrics, family medicine | 2909 | Not specified | Not specified | Serious error, minor error, near miss |
| Wu et al. | 1991 | United States | Cross-sectional study design applying descriptive and inferential statistics; paper-and-pencil, self-report questionnaire (developed by the research team; closed- and open-ended questions) | Inpatient care | Internal medicine house officers | 114 | Within the previous year | Errors in diagnosis, evaluation and treatment, prescribing and dosing, procedural complications, faulty communication | Serious consequences, potentially serious consequences | e.g., death, delayed treatment, stroke, amputation, respiratory failure, small amount of bleeding, fatal tension pneumothorax, resuscitation performed against the patient’s wishes |

*We used for the meta-analyses slightly varying sample sizes according to the respective variable of interest (n1 = 1019, n2 = 1022, n3 = 1024).
†Categories as defined by the National Coordinating Council for Medication Errors Reporting and Prevention.
‡We used for this study only the quantitative data generated from the national questionnaire survey.*
in the entire career\textsuperscript{36}, whereas others mentioned a narrow one (e.g., within the previous 3 months\textsuperscript{38}). The adverse events, though heterogeneous, were mostly related to errors in diagnosis, evaluation, treatment, and communication. Categories describing the severity of the adverse events (e.g., serious error – minor error – near miss) were used in nine articles. In addition, eight studies gave examples of patient outcomes, ranging from physical discomfort through prolonged hospital stay to severe disability and death.

Prevalence of Psychological and Psychosomatic Symptoms

Meta-analyses

We calculated the overall prevalence rates for 21 symptoms experienced by second victims in the aftermath of adverse events (Table 2). The most prevalent symptoms were troubling memories (81\%, 95\% CI = 46–95) (Fig. 2), anxiety/concern (76\%, 95\% CI = 33–95), anger toward themselves (75\%, 95\% CI = 59–86), regret/remorse (72\%, 95\% CI = 62–81), distress (70\%, 95\% CI = 60–79), fear of future errors (56\%, 95\% CI = 34–75), embarrassment (52\%, 95\% CI = 31–72), guilt (51\%, 95\% CI = 41–62), and sleeping difficulties (35\%, 95\% CI = 22–51), which was the only psychosomatic symptom we were able to pool (Fig. 3). All forest plots can be found in the Supplemental Data File 6, http://links.lww.com/JPS/A227. F estimates ranged between 0\% and 53.1\% indicating negligible to moderate heterogeneity across studies. We did not conduct subgroup analysis given the small amount of data available for this purpose.

Unpooled Prevalence rates

Because of a lack of sufficient data from different studies and/or too heterogeneous variables of interest, and to prevent overlaps, we did not pool all prevalence rates reported in the primary studies (see Supplemental Data File 7, http://links.lww.com/JPS/A227 for an overview of the ungrouped variables and their prevalence rates).

Two studies\textsuperscript{18,46} explicitly assessed the occurrence of posttraumatic stress disorder (PTSD), each using a different questionnaire. These showed 5\% (95\% CI = 4–7; 81/1628)\textsuperscript{18} and 17\% (95\% CI = 14–20; 102/601)\textsuperscript{46} prevalence rates of probable PTSD, respectively. Dhillon et al.\textsuperscript{40} evaluated the impact of adverse events on cognitive functioning, reporting difficulty concentrating (79\% of the participants; 26/33) and that 9\% (22/245) of the enrolled anesthesiologists experienced the psychosomatic symptom of change in appetite.

| TABLE 2. Overall Prevalence Rates of Second Victims’ Psychological and Psychosomatic Symptoms |
|-----------------------------------------------|
| **Symptom**                                | **Overall Prevalence Rate, %** | **95\% CI**   | **I\(^2\)** | **Studies, n** |
|-----------------------------------------------|---------------------------------|---------------|-------------|----------------|
| Troubling memories                            | 81                              | 46–95         | 27.8        | 3              |
| Anxiety/concern                               | 76                              | 33–95         | 46.1        | 3              |
| Anger toward oneself                          | 75                              | 59–86         | 4.8         | 5              |
| Regret/remorse                                | 72                              | 62–81         | 0           | 3              |
| Distress                                      | 70                              | 60–79         | 0           | 2              |
| Fear of future errors                         | 56                              | 34–75         | 0           | 5              |
| Embarrassment                                 | 52                              | 31–72         | 13.6        | 4              |
| Guilt                                         | 51                              | 41–62         | 53.1        | 12             |
| Frustration                                   | 49                              | 43–55         | 0           | 2              |
| Anger                                         | 44                              | 6–91          | 0           | 3              |
| Fear                                          | 43                              | 32–54         | 0           | 3              |
| Feelings of inadequacy                        | 42                              | 27–59         | 0           | 7              |
| Reduced job satisfaction                      | 41                              | 36–47         | 52.2        | 3              |
| Concern regarding colleagues’ reactions       | 39                              | 14–71         | 0           | 3              |
| Symptoms of depression                        | 36                              | 20–56         | 48.6        | 9              |
| Fears of repercussions/official consequences  | 36                              | 21–54         | 0           | 6              |
| Sleeping difficulties                         | 35                              | 22–51         | 5.0         | 5              |
| Anger toward others                           | 33                              | 18–52         | 0           | 4              |
| Loss of confidence                            | 27                              | 18–38         | 6.5         | 10             |
| Concern regarding patients’ reactions         | 8                               | 0–70          | 0           | 2              |
| Self-doubts                                   | 6                               | 2–14          | 0           | 2              |
Anxiety can negatively influence cognitive functioning (e.g., working memory and concentration difficulties, attentional lapses, intrusive thoughts) in turn leading to difficulties in social and work settings. Moreover, anxiety and the fear of future errors may result in overcontrolling behaviors (e.g., excessive double-checking), which may undermine healthcare providers’ efficiency and actually increase error proneness. It is also well known that anger directed toward oneself or toward others is a feature of dysfunctional coping strategies and linked to the risk of burnout. Anger represents an emotion that, if not properly addressed, tends to reinforce defensive attitudes and to negatively affect interpersonal relationships as well as the quality of communication in the workplace. These may impede risk management and lead to medical errors.

Consistent with Wu and Scott et al., our results showed that healthcare providers often experience medical errors as a personal failure. Emotional reactions such as embarrassment, fear of future errors, frustration, and the feeling of inadequacy are often associated with adverse events. The occurrence of these symptoms might be the consequence of the common expectation for perfection, shaped by external punitive attitudes in the health care system or by internalized norms. It also demonstrates that effort is needed to reduce the distress caused by this culture of perfection and to promote instead the concept of “Just Culture.” Just Culture focuses on system failures to improve patient safety and recognizes at the same time individual behaviors as contributors to risk for which the involved healthcare provider should accept responsibility. Although there is growing agreement that it is important to shift healthcare away from the traditional approach of blame and judgment, these attitudes are persistent as it is shown by the high prevalence of concern regarding colleagues’ reactions. Interestingly, our results also suggested that this self-critical attitude did not take into account the role of the patient. Indeed, despite

### TROUBLING MEMORIES

| Authors (Year)            | Prevalence rate | Lower limit | Upper limit | p-value | Prevalence and 95%CI |
|---------------------------|-----------------|-------------|-------------|---------|----------------------|
| Joesten et al. (2015)     | 56%             | 47          | 64          | .202    |                      |
| Wahlberg et al. (2016)    | 67%             | 65          | 70          | .000    |                      |
| Schroder et al. (2016)    | 97%             | 95          | 98          | .000    |                      |
| OVERALL PREVALENCE OF TROUBLING MEMORIES | 81% | 46 | 95 | .880 |                      |

P= 27.8%

**Meta Analysis**

**FIGURE 2.** Forest plot showing the overall prevalence of troubling memories, the prevalence rates for the primary studies, the respective 95% CI, the P values, and the I² statistic.

### SLEEPING DIFFICULTIES

| Authors (Year)            | Prevalence rate | Lower limit | Upper limit | p-value | Prevalence and 95%CI |
|---------------------------|-----------------|-------------|-------------|---------|----------------------|
| Cramer et al. (2012)      | 15%             | 13          | 17          | .000    |                      |
| Dhillon et al. (2015)     | 32%             | 27          | 38          | .000    |                      |
| McLennan et al. (2015)    | 36%             | 30          | 41          | .000    |                      |
| Waterman et al. (2007)    | 42%             | 40          | 44          | .000    |                      |
| Harrison et al. (2014)    | 57%             | 55          | 60          | .000    |                      |
| OVERALL PREVALENCE OF SLEEPING DIFFICULTIES | 35% | 22 | 51 | .057 |                      |

P= 5.0%

**Meta Analysis**

**FIGURE 3.** Forest plot showing the overall prevalence of sleeping difficulties, the prevalence rates for the primary studies, the respective 95% CI, the P values, and the I² statistic.
frequently described feelings of guilt, regret, and remorse by second victims, we found a relatively low overall prevalence (8%) of second victims’ concerns about patients’ reactions (i.e., anxiety about loss of patient’s trust and fear of having to speak to the patient and/or family). This result seems to suggest that healthcare providers are much less concerned about patients as self-determining partners in the process of care and that they place a higher priority on the risk posed by the reactions of their colleagues. However, this finding needs to be interpreted with caution because second victims’ self-doubts were explored in only two studies, limiting generalizability. Future studies should further explore this provocative finding.

Implications for Clinical Practice and Policy

Our results highlight the importance of recognizing the significant distress experienced by second victims and addressing those needs in practice, education, and policy. The first priority is to support health care workers. As recently acknowledged by the Joint Commission in the United States, health care managers should provide easily accessed support programs tailored to the specific needs of the second victim, following already successful approaches, such as RISE at the Johns Hopkins Hospital. RISE provides peer-to-peer support to health care workers who have experienced a stressful patient-related incident or adverse event. The RISE team is composed of trained responders from different disciplines (e.g., physicians, nurses, chaplains, social workers) who deliver psychological first aid to peers in a confidential, nonjudgmental environment.

Broad education can provide a foundation for a more supportive health care environment. It will be important to raise awareness of work stress, the second victim phenomenon, and patient safety, through informational campaigns and educational programs for healthcare workers. Those individuals interested in playing a more active role can be trained to provide peer support and psychological first aid. Such programs should acknowledge the role of human factors in work and safety, as also recommended by Hollnagel et al. Policy makers should require health care organizations to make these programs available to staff and monitor their implementation and use. These preventive and supportive strategies are expected to reduce second victims’ psychological distress and to help create a Just Culture. Indeed, the humanity and fallibility of health care workers need to be acknowledged and accounted for in the design of the system while simultaneously maintaining the expectation that they deliver high-quality care.

Such a culture may also make it easier for the involved healthcare providers to initiate open, transparent discussions with the patients and their families about the adverse event, a step that has been shown to be highly appreciated.

limitations

Our study had some limitations. First, the primary studies included in our review were heterogeneous in terms of instruments used, participants’ profession, medical setting, and characterization of the adverse event (i.e., definition, point in time, type, severity, patient outcomes). In some cases, the articles differed from one another in reported prevalence, as reflected by the wide confidence intervals around overall estimates of prevalence. However, quantitative analyses did not indicate substantial heterogeneity across studies. Second, the study is subject to the limitations related to the included cross-sectional, self-report studies. Biases due to self-selection by respondents and recall may have affected the results of the primary studies, which were reflected in our meta-analyses. Third, the primary studies did not capture the intensity, duration, and clinical relevance of individual symptoms and if the healthcare providers had a history of mental disorders. These limitations could be overcome by future longitudinal studies of healthcare providers to record the incidence and the impact of adverse events and to clinically evaluate symptoms before and after an adverse event. To gain a better understanding about the predictors of psychological distress after adverse events, personality characteristics and contextual variables (e.g., existence of punitive culture at workplace, severity of adverse event) could be assessed in such longitudinal studies. Fourth, because of insufficient data and heterogeneous variables of interest, some prevalence rates of psychological and psychosomatic symptoms reported in the primary studies were not grouped and thus were excluded from the meta-analyses. Notably, we were only able to meta-analyze the prevalence rates of one psychosomatic symptom, namely, sleeping difficulties, because additional psychosomatic symptoms were examined in only one study. A recent qualitative study suggests that second victims experience a broad range of psychosomatic symptoms, such as extreme fatigue, increased respiratory rate and blood pressure, tachycardia, and muscle tension. Given the paucity of research on psychosomatic symptoms of second victims, future studies should explore this aspect further. In particular, quantitative methods, such as diagnostic tests or questionnaires, should be applied to thoroughly study the type and prevalence of psychosomatic symptoms experienced by second victims. Using quantitative instead of qualitative methodology would allow for greater objectivity and reliability of the results and would enhance their generalizability. Finally, this study focused only on the psychological impact of adverse events on second victims, without investigating the use of coping strategies in the aftermath of such an event. To overcome this limitation, we are planning to conduct an additional meta-analysis in the future.

conclusions

Our meta-analysis, which included information from 11,649 healthcare providers involved in adverse events, provides an accurate overview of the severe psychological burden affecting second victims. These symptoms have serious repercussions for the well-being and fitness of the healthcare workforce. This evidence should be useful to develop and implement and evaluate support programs tailored to the specific needs of second victims. Such programs, in the long run, might have the potential to decrease the incidence of medical errors and increase patient safety, improving the overall quality of medical care.

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