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

Isolde M. Busch, MSc,† Francesca Moretti, MD, PhD,‡ Marianna Purgato, PhD,§,|| Corrado Barbui, MD,§,|| Albert W. Wu, MD, MPH,† and Michela Rimondini, PhD**

Objectives: Despite growing interest in the second-victim phenomenon and greater awareness of its consequences, there has not been a meta-analysis quantifying the negative impact of adverse events on providers involved in adverse events. This study systematically reviewed the types and prevalence of psychological and psychosomatic symptoms among second victims.

Methods: We conducted a systematic review of nine electronic databases up to February 2017, without restrictions to publication date or language, examining also additional sources (e.g., gray literature, volumes of journals). Two reviewers performed the search, selection process, quality assessment, data extraction, and synthesis. We resolved disagreements by consensus and/or involving a third reviewer. Quantitative studies on the prevalence of psychological and psychosomatic symptoms of second victims were eligible for inclusion. We used random effects modeling to calculate the overall prevalence rates and the I^2 statistic.

Results: Of 7210 records retrieved, 98 potentially relevant studies were identified. Full-text evaluation led to a final selection of 18 studies, based on the reports of 11,649 healthcare providers involved in adverse events. The most prevalent symptoms were troubling memories (81%, 95% confidence interval [CI] = 46–95), 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).

Conclusions: Second victims report a high prevalence and wide range of psychological symptoms. More than two-thirds of providers reported troubling memories, anxiety, anger, remorse, and distress. Preventive and therapeutic programs should aim to decrease second victims' emotional distress.

Key Words: human factors, second victim, mental health, adverse event, risk management

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From the *Section of Clinical Psychology, Department of Neuroscience, Biomedicine and Movement Sciences, University of Verona, Verona, Italy; †Department of Health Policy and Management, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland; ‡Section of Hygiene and Preventive Medicine, Department of Diagnostic and Public Health, University of Verona; §WHO Collaborating Centre for Research and Training in Mental Health and Service Evaluation, Section of Psychiatry, University of Verona, and ||Cochrane Global Mental Health, University of Verona, Verona, Italy.

Correspondence: Michela Rimondini, PhD, Section of Clinical Psychology, Department of Neurosciences, Biomedicine and Movement Sciences, University of Verona. Policlinico G.B. Rossi, Piazzale L.A. Scuro 10, 37134 Verona, Italy (e-mail: michela.rimondini@univr.it).

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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.[7,8] 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.*[9]

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,[19] with more research on the topic, greater awareness of its negative impact on healthcare,[15,22] and successful implementation of psychosocial support programs especially in the United States (e.g., *RISE – Resilience in Stressful Events*, Johns Hopkins Hospital, Maryland[23]; *forYou*, University of Missouri Health Care, Columbia, Missouri[24]; *Medically Induced Trauma Support Services*, Chestnut Hill, Massachusetts[25]). 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 experienc* 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.[30] 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,[31] 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 *anxiety*[37] was considered more appropriate than *panic/worries*[37] 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 I^2 statistic as recommended in the Cochrane Handbook[38]: I^2 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. We contacted the authors of the primary study in six cases to request additional information. 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*.[33] 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),[18,34–37,39–51] all written in English except for one in German,[34] 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[35] was conducted both in Canada and in the United States. Aside from O'Beirne et al.[48] 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., correlational or regression analyses). All authors used paper-and-pencil or web-based/electronic self-report questionnaires with predominantly closed-ended questions. Schrøder et al.[49] additionally conducted semistructured interviews; however, we included only the quantitative data reported by Schrøder et al.[49] 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.[44] or Waterman et al.[35] Well-established clinical questionnaires, such as the *PTSD Symptom Scale Self-Report version*[54] and the *Primary Care Evaluation of Mental Disorders*,[55] 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 40[41] to 2909,[35] 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*

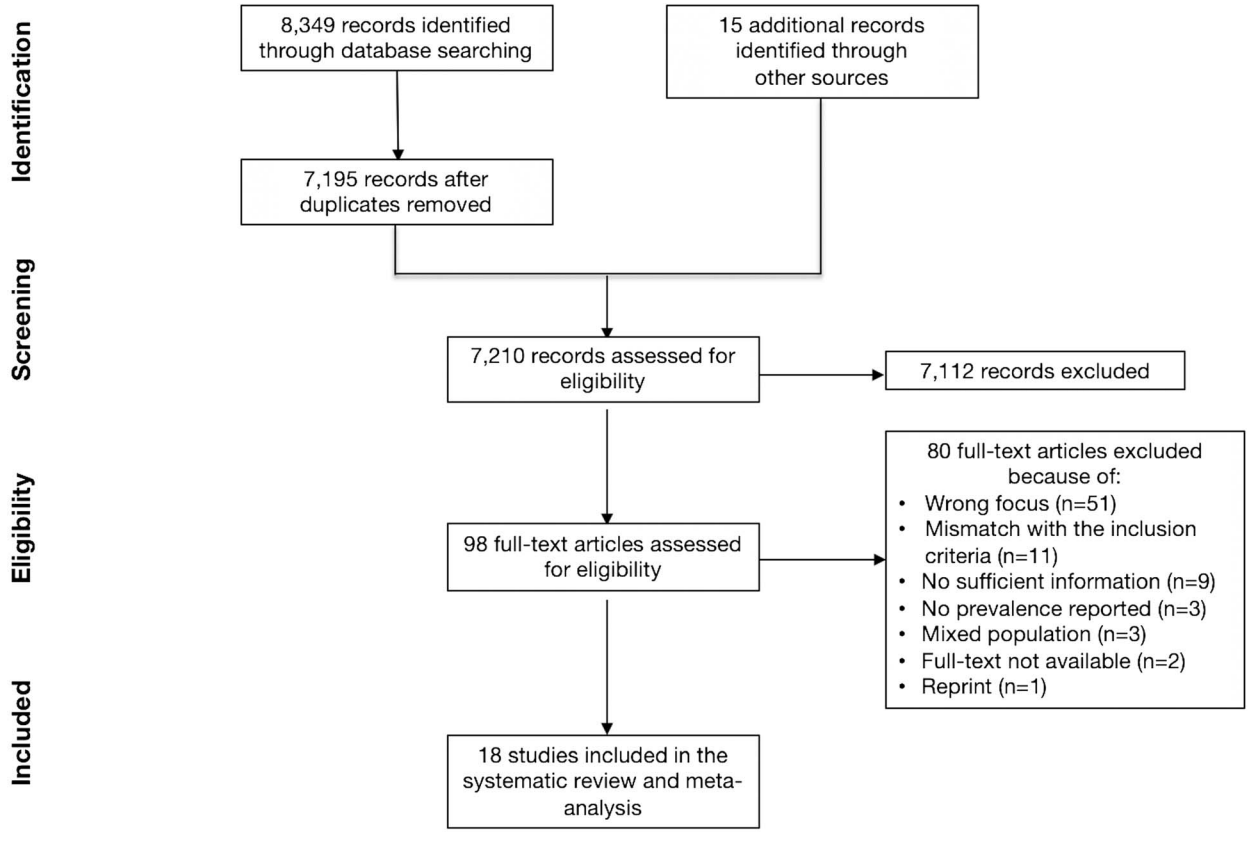

FIGURE 1. The PRISMA flow diagram.

TABLE 1. Characteristics of the Included Studies

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
Chard[39]	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	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	Not specified

Dhillon et al.[40]	2015	United States	Cross-sectional study design applying descriptive and inferential statistics; web-based, self-report questionnaire (developed by the research team; closed- and open-ended questions)	Not specified	Anesthesiologists (members of the American Society of Anesthesiologists)	245	Not specified	Perioperative errors (e.g., drug error)	Not specified	e.g., death, anaphylaxis, anoxic brain injury, massive hemorrhage, venous air embolism
Harrison et al.[36]	2014	United Kingdom	Cross-sectional study design applying descriptive statistics; web-based, self-report questionnaire (modified version of the questionnaire used by Waterman et al.[35]; closed-ended questions)	Not specified	Physicians in internal medicine (members and fellows of the Royal College of Physicians)	1463	At any point in the entire career	Not specified	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	Not specified
Hobgood et al.[41]	2005	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	Emergency medicine residents	40	Not specified	Medication errors, diagnostic errors, evaluation and treatment errors, procedural errors, communication errors	Not specified	Death, clinical deterioration, severe disability, physical discomfort, emotional distress, need for additional therapy, monitoring and procedures, increased length of stay
Joesten et al.[42]	2015	United States	Cross-sectional study design applying descriptive statistics; web-based, modified version of the self-report "Medically Induced Trauma Support Services Staff Support Survey" (closed-ended questions)	Inpatient care	Nurses, physicians (Doctors of Medicine, Doctors of Osteopathic Medicine) working in a children and adult community teaching hospital	120	Within the previous 3 y (between 2008 and 2010)	Wrong site surgery as only example mentioned	Patient safety event with actual adverse outcome, near miss	e.g., unexpected patient death, transfusion reaction, adverse drug reaction, patient fall, other unanticipated outcomes

(Continued next page)

TABLE 1. *(Continued)*

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.[43]	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.[46]	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.[47]	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

Meurier et al.[45]	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.[44] (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	Severely compromised functioning, moderately compromised functioning, mildly compromised functioning
O'Beirne et al.[48]	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)	Not specified
Schrøder et al.[49]	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)

TABLE 1. *(Continued)*

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.[50]	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 Valiee[51]	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.[18]	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

Waterman et al.[35]	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	Not specified
Wu et al.[44]	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 ($n_1 = 1019$, $n_2 = 1022$, $n_3 = 1024$).

†Categories as defined by the National Coordinating Council for Medication Errors Reporting and Prevention.[52,53]

‡We used for this study only the quantitative data generated from the national questionnaire survey.

in the entire career[36]), whereas others mentioned a narrow one (e.g., *within the previous 3 months*[50]). 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. I^2 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[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)[18] and 17% (95% CI = 14–20; 102/601)[46] prevalence rates of probable PTSD, respectively. Dhillon et al.[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.

DISCUSSION

This study expands on previous research on the psychological impact of adverse events on healthcare providers by providing precise estimates of the prevalence of the symptoms affecting second victims. To our knowledge, this is the first systematic review and meta-analysis quantifying psychological and psychosomatic symptoms of these providers. Our results confirm that healthcare providers involved in adverse events are highly affected by a wide range of psychological symptoms. More than two-thirds of providers reported troubling memories, anxiety, anger, remorse, and distress. More than half reported fear of future errors, embarrassment, and guilt. A third reported difficulty sleeping.

Troubling memories had the highest overall prevalence with 81% reporting this symptom. It is well known that unwanted upsetting memories and flashbacks are common after traumatic experiences in general.[56,57] Although we did not pool the results of the two primary studies specifically focusing on the prevalence of probable PTSD,[18,46] the overall high prevalence of troubling memories, anxiety/concern, distress, symptoms of depression, sleeping difficulties, and loss of confidence suggests symptoms commonly associated with PTSD.[58,59]

Three quarters of providers studied experienced anxiety, and a similar number reported anger at themselves. The intensity, duration, and clinical relevance of these emotional reactions were not systematically explored in the primary studies, but these symptoms have been demonstrated to reduce professional performance.

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

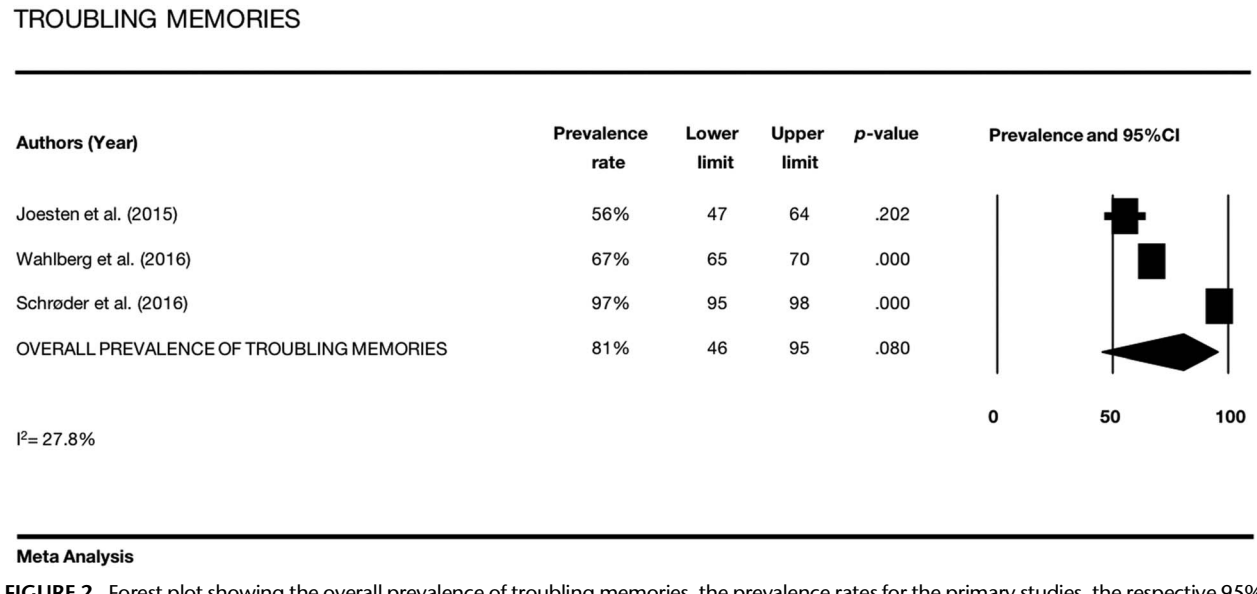

FIGURE 2. Forest plot showing the overall prevalence of troubling memories, the prevalence rates for the primary studies, the respective 95% CI, the *P* values, and the I^2 statistic.

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.[60] 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.[34] It is also well known that anger directed toward oneself or toward others is a feature of dysfunctional coping strategies[61] and linked to the risk of burnout.[62] Anger represents an emotion that, if not properly addressed, tends to reinforce defensive attitudes[63] and to negatively affect interpersonal relationships[64] as well as the quality of communication in the workplace.[65] These may impede risk management[66] and lead to medical errors.[41,44,45]

Consistent with Wu[8] and Scott et al.,[7] 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.[8,21] It also demonstrates that effort is needed to reduce the distress caused by this culture of perfection[8,67] 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.[68] Although there is growing agreement that it is important to shift healthcare away from the traditional approach of blame and judgment,[26,69] 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

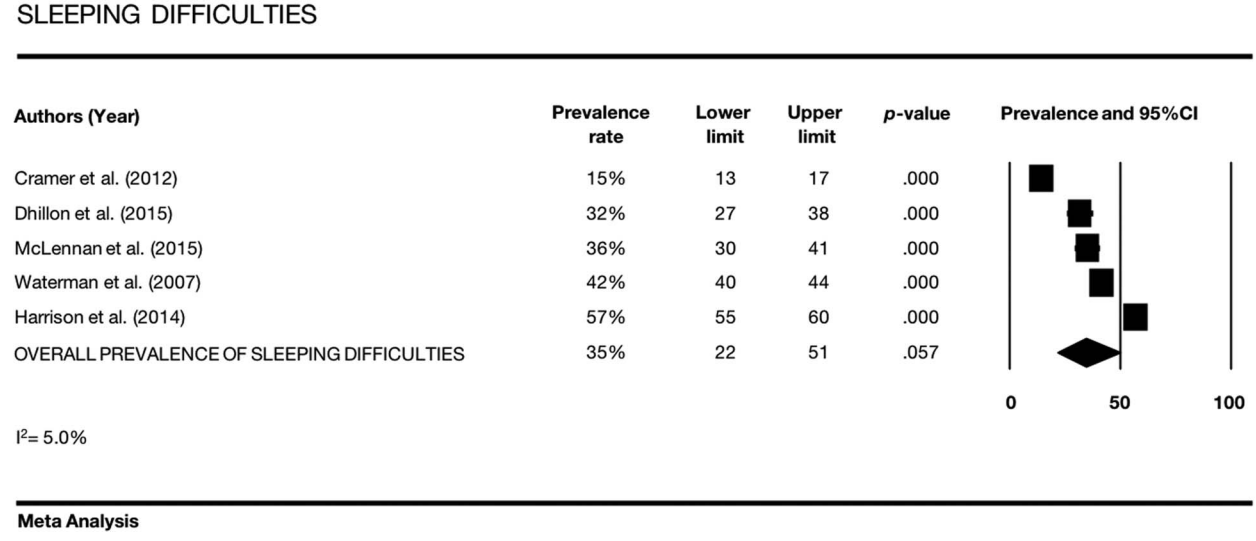

FIGURE 3. Forest plot showing the overall prevalence of sleeping difficulties, the prevalence rates for the primary studies, the respective 95% CI, the *P* values, and the I^2 statistic.

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*[37] *and fear of having to speak to the patient and/or family*[42]). This result seems to suggest that healthcare providers are much less concerned about patients as self-determining partners in the process of care[70] 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.[23,71] *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.[72] Such programs should acknowledge the role of human factors in work and safety, as also recommended by Hollnagel et al.[67] 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.[73]

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[74] and recall[75] 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,[18,35,47] 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.[40] A recent qualitative study[76] 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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