



Second victim experiences among Austrian nonphysician emergency medical services personnel

A cross-sectional analysis of symptom burden and associated factors

Katharina Tscherny · Victoria Klemm · Herbert Huscsava · Stefan Dür · Eva Potura · Reinhard Strametz

Received: 26 June 2026 / Accepted: 20 August 2026
 © The Author(s) 2026

Summary

Background Second victim experiences have been described across health professions but evidence for Austrian prehospital emergency medical services (EMS) remains limited. This study assessed the prevalence, key events and factors associated with high symptom burden among Austrian nonphysician emergency medical services personnel.

Methods We conducted a cross-sectional study within the Second Victims in German-speaking Countries (SeViD) research program using the standardized SeViD questionnaire among Austrian nonphysician EMS personnel. The SeViD-A4 denotes the fourth Austrian study within this program and does not refer to a separate questionnaire. Second victim status was recorded dichotomously and symptom burden was dichotomized for univariate analyses and multivariable binary logistic regression. The questionnaire included demographic and occupational variables, second victim experience, key event category, support after the key event, recovery, symptom reactions, support preferences and 10-item Big Five Inventory (BFI-10) personality dimensions.

Results A total of 1171 questionnaires were included and 60.1% of the respondents identified as second victims. Among participants with a second victim experience and valid key event data ($n = 704$), the most com-

mon key events were unexpected patient death or patient suicide (41.8%) and aggression by patients or relatives (18.8%). The multivariable complete case analysis included 698 participants, of whom 336 had high symptom burden. High symptom burden was associated with neuroticism (odds ratio, OR 1.44), openness (OR 1.21), patient volume per 100 additional patients per quarter (OR 1.14), professional compared with volunteer EMS work (OR 1.52), and lack of support despite seeking help (OR 5.98). Self-reported male gender was associated with lower odds of high symptom burden (OR 0.62).

Conclusion Second victim experiences were frequent in this nationwide Austrian convenience sample. High symptom burden was associated with individual, workload-related, employment-related and support-related factors. Low-threshold peer support and structured follow-up represent plausible organizational targets but their effectiveness requires prospective evaluation.

Keywords Critical incidents · Paramedics · Prehospital care · Psychological distress · Peer support

K. Tscherny (✉)
 Department of Emergency Medicine, Medical University of Vienna, Währinger Gürtel 18-20, 1090 Vienna, Austria
katharina.tscherny@icloud.com

V. Klemm
 Wiesbaden Institute for Healthcare Economics and Patient Safety, Rhein Main University of Applied Sciences, Wiesbaden, Germany

H. Huscsava · E. Potura
 The Second Victim Association Austria, Vienna, Austria

S. Dür
 University Potsdam Faculty of Economics and Social Sciences, Potsdam, Germany

E. Potura
 Austrian National Public Health Institute, Vienna, Austria

R. Strametz
 Institute of Occupational, Social and Environmental Medicine, Goethe University Frankfurt, Frankfurt am Main, Germany

Second-Victim-Erfahrungen bei nichtärztlichem Rettungsdienstpersonal in Österreich Eine Querschnittsanalyse zu Symptombelastung und assoziierten Faktoren

Zusammenfassung

Hintergrund Second-Victim-Erfahrungen wurden bereits in verschiedenen Gesundheitsberufen beschrieben, für den österreichischen präklinischen Rettungsdienst ist die Evidenz jedoch weiterhin begrenzt. Ziel dieser Studie war es, die Prävalenz, die auslösenden Schlüsselereignisse und die mit einer hohen Symptombelastung assoziierten Faktoren bei nicht-ärztlichem Rettungsdienstpersonal in Österreich zu untersuchen.

Methoden Im Rahmen des Forschungsprogramms „Second Victims im Deutschsprachigen Raum“ (SeViD) führten wir eine Querschnittsstudie unter österreichischem nichtärztlichem Rettungsdienstpersonal mittels des standardisierten SeViD-Fragebogens durch. SeViD-A4 bezeichnet die vierte österreichische Studie innerhalb dieses Forschungsprogramms und keinen eigenständigen Fragebogen. Der Second-Victim-Status wurde dichotom erfasst. Die Symptombelastung wurde für die univariaten Analysen und die multivariable binär-logistische Regression dichotomisiert. Der Fragebogen umfasste demografische und berufsbezogene Variablen, Second-Victim-Erfahrungen, die Kategorie des Schlüsselereignisses, erhaltene Unterstützung, den Erholungsverlauf, symptomatische Reaktionen, Unterstützungspräferenzen sowie die Persönlichkeitsdimensionen des 10-Item Big Five Inventory (BFI-10).

Ergebnisse Insgesamt wurden 1171 Fragebögen eingeschlossen; 60,1 % der Befragten bezeichneten sich selbst als Second Victims. Unter den Teilnehmenden mit Second-Victim-Erfahrung und gültigen Angaben zum Schlüsselereignis ($n=704$) waren der unerwartete Tod oder Suizid von Patient:innen (41,8 %) und Aggression durch Patient:innen oder Angehörige (18,8 %) die häufigsten Schlüsselereignisse. Die multivariable Complete-Case-Analyse umfasste 698 Personen, von denen 336 eine hohe Symptombelastung aufwiesen. Eine hohe Symptombelastung war mit Neurotizismus (OR 1,44), Offenheit (OR 1,21), dem Patient:innenaufkommen je 100 zusätzliche Patient:innen pro Quartal (OR 1,14), einer hauptberuflichen gegenüber einer ehrenamtlichen Rettungsdiensttätigkeit (OR 1,52) und fehlender Unterstützung trotz Hilfesuche (OR 5,98) assoziiert. Das selbstberichtete männliche Geschlecht war mit einer geringeren Odds-Ratio für hohe Symptombelastung assoziiert (OR 0,62).

Schlussfolgerung Second-Victim-Erfahrungen waren in dieser österreichweit rekrutierten Gelegenheitsstichprobe häufig. Eine hohe Symptombelastung war mit individuellen, arbeitsbezogenen, beschäftigungsbezogenen und unterstützungsbezogenen Faktoren assoziiert. Niederschwelliger Peer-Support und struk-

turierte Nachbetreuung stellen plausible organisationale Ansatzpunkte dar, deren Wirksamkeit prospektiv evaluiert werden muss.

Schlüsselwörter Kritische Ereignisse · Rettungssanitäter:innen · Präklinische Versorgung · Psychische Belastung · Peer-Support

Introduction

The second victim phenomenon describes the negative impact that unanticipated adverse events, patient harm, medical errors, or emotionally overwhelming clinical situations can have on the healthcare workers involved [1–5]. Beyond immediate distress, affected professionals can experience guilt, shame, self-doubt, intrusive recollections, sleep disturbance, reduced professional confidence, absenteeism, intention to leave the profession, or defensive practice [3–7]. The phenomenon is therefore relevant not only from an individual psychological perspective but also as a patient safety, staff safety and organizational resilience issue [8, 9]. Second victim support should consequently be understood as part of safety culture rather than as an optional individual coping resource.

Prehospital emergency care represents a distinct high-risk clinical environment. Emergency medical services (EMS) personnel frequently make time-critical decisions under conditions of uncertainty, with incomplete information, limited diagnostic resources, changing team constellations and restricted opportunities for immediate escalation. At the same time, they can be exposed to unsafe scenes, severe injury, failed resuscitation, unexpected death, suicide, pediatric emergencies and aggression from patients or relatives. International patient safety literature has shown that safety incidents occur in prehospital care, while definitions, measurement approaches, and monitoring strategies remain heterogeneous [10–12]. Empirical work on prehospital adverse events and clinical decision-making further underlines the relevance of deviations from standard care, incomplete documentation, occupational and environmental factors, organizational constraints, and ethical pressure as challenges in EMS practice [13, 14].

For EMS research, it is important to distinguish preventable patient safety incidents from emotionally overwhelming clinical events. Second victim experiences can arise after actual or perceived errors but also after events that are not fully preventable, such as unexpected death, suicide, unsuccessful resuscitation, severe pediatric emergencies, or aggression. This distinction is especially relevant in the prehospital setting, where psychological burden can result not only from patient harm or medical error but also from repeated exposure to severe human suffering, moral responsibility, limited controllability, and incomplete feedback on patient outcomes [10–14].

Evidence from German-speaking countries has grown substantially through the Second Victims in German-speaking Countries (SeViD) research program. In the designation SeViD-A4 used for the present study, “A” refers to Austria and “4” identifies it as the fourth Austrian study conducted within the SeViD research program. SeViD-A4 is therefore a study identifier and does not denote a separate version of the standardized SeViD questionnaire.

Earlier SeViD studies reported second victim prevalence estimates of 59% among young German physicians in internal medicine, about 60% among German nurses, and 53.1% among German emergency medical services physicians [15–17]. In Austria, high prevalences have been described among pediatricians, nurses, and midwives, with profession-specific differences in triggering events and symptom profiles [18–20]. Recent SeViD studies in the prehospital rescue chain, including emergency medical dispatchers and German emergency medical technicians, indicate that second victim experiences are not limited to hospital-based care or to physicians, but occur across different professional groups involved in emergency care [21, 22].

Despite this growing evidence, nonphysician EMS personnel in Austria have not yet been systematically investigated. This represents an important evidence gap because the Austrian EMS system includes both professional and volunteer personnel, different qualification levels, temporary civil service personnel and heterogeneous organizational support structures. The present study is therefore the first cross-sectional quantitative survey of second victim experiences among Austrian nonphysician EMS personnel using nationwide recruitment.

Specifically, we sought to estimate the prevalence of second victim experiences, describe the most common key events, characterize symptom burden, and identify individual, work-related, and support-related factors associated with high symptom burden. Particular attention was given to support-related variables, because accessible and responsive postevent support represents one of the few modifiable organizational factors in second victim prevention and intervention [8, 9, 23–25].

Patients, material and methods

This manuscript reports a cross-sectional analysis of the SeViD-A4 survey conducted among nonphysician emergency medical services personnel in Austria. The study was part of the German-language SeViD research program and used the standardized SeViD questionnaire.

The survey was conducted among emergency medical services personnel working in the Austrian prehospital setting and was distributed nationwide through the Austrian paramedic association newslet-

ter to approximately 5000 members to obtain a large nationwide convenience sample.

Data collection was performed with SurveyMonkey (SurveyMonkey Inc., San Mateo, CA, USA) between 1 May 2024 and 8 August 2024. Participation was voluntary and anonymous; no IP addresses, cookies, or other directly identifying personal data were stored.

Questionnaire and variables

The study used the standardized SeViD questionnaire and included demographic variables, occupational characteristics, second victim experience, key events, support after key events, recovery, symptom items, support-related preference items, and the 10-item Big Five Inventory (BFI-10) for the Big Five personality dimensions [26, 27].

The online survey comprised 24 question blocks organized into 5 sections: demographic and occupational characteristics (8 questions); second victim experiences, key events, recovery, symptoms, and support preferences (12 question blocks, including 20 symptom items and 13 support preference items); peer-support experiences (2 questions); BFI-10 personality traits (1 matrix comprising 10 items) and optional comments (1 free-text question). Adaptive routing was applied according to participants' second victim status and previous experience. Symptom items used four response categories, support preference items used five response categories, and BFI-10 items were rated on a 5-point scale from 1, “does not apply at all”, to 5, “applies completely”.

The present analysis included active volunteer or professional nonphysician EMS personnel aged 18–67 years working in Austria. Individuals younger than 18 or older than 67 years, retired personnel, emergency physicians, members of other emergency organizations or healthcare professions, and respondents working outside Austria were excluded. Emergency medical dispatchers, call takers, acute intervention nurses, and personnel from other emergency services were not eligible as separate occupational groups.

For the present analysis, the questionnaire domains comprised demographic and occupational characteristics, including gender, age, EMS qualification, EMS activity model, years of experience, and patient numbers per quarter year, second victim status, one key-event item with predefined response categories, one support after key event item, recovery after the key event, symptom reactions, support preferences and sources of support and the 10 BFI-10 personality items.

Symptom reactions were analyzed as a multi-item symptom burden measure, and BFI-10 dimensions were computed according to the published scoring instructions using two items per Big Five dimension after reverse coding where required. Odds ratios for BFI-10 traits therefore refer to a one-unit increase in the

respective dimension score. The use of the standardized SeViD questionnaire enables direct comparison between professional groups.

The EMS activity model and working-time status were treated as conceptually distinct variables. The EMS activity model distinguished volunteer from professional EMS work, whereas working time status captured full-time versus part-time employment. These constructs were analyzed separately because respondents could be active as volunteer EMS personnel while also working full-time outside the EMS.

To estimate prevalence, participants were asked about their second victim experience and to describe key events. The main inferential outcome of the present manuscript was high overall symptom burden. Overall symptom burden was operationalized as the mean across symptom items after recoding responses to an ascending scale and treating “I do not know” as missing. For regression analyses, symptom burden was dichotomized at the sample median (median split: 1.6) into low versus high symptom burden to facilitate logistic regression and ease interpretation. The final multivariable logistic regression model comprised 13 estimated parameters and was based on 336 outcome events (approximately 26 events per parameter), indicating an adequate sample size and a low risk of overfitting due to insufficient outcome events.

Statistical analysis

We summarized participant characteristics and assessment measures using descriptive statistics. For continuous variables, we report means (M) and standard deviations (SD), whereas categorical and ordinal variables are presented as frequencies (*n*) and percentages (%). All analyses were performed using SPSS Statistics 29 (IBM, Armonk, NY, USA). Statistical significance was set at $p < 0.05$.

Exploratory univariate associations with second victim experience and high symptom burden were examined using χ^2 -tests for categorical variables and Mann-Whitney U-tests for metric variables. To control the family-wise type I error rate, Holm's sequential procedure was applied separately to each outcome-specific family of univariate analyses. The multivariable binary logistic regression model included gender, EMS activity model, prior awareness of the second victim concept, key event category, support after the key event, patient volume, neuroticism, and openness. These variables represented demographic, occupational, event-related, support-related, workload, and personality domains of substantive interest. No automated stepwise selection procedure was used.

Candidate variables were selected based on conceptual relevance. Holm-adjusted univariate significance was not used as an automatic criterion for model inclusion. Participants in the diverse gender category were excluded from the gender-based re-

gression analysis because of the insufficient cell size. Missing data were handled using listwise exclusion; observations with missing values on any variable included in a given analysis were excluded from that analysis.

Collinearity diagnostics were acceptable with variance inflation factors below 3. Linear relationships between continuous covariates and the logit were assessed with the Box-Tidwell procedure and showed no relevant violations. Model performance was summarized using Nagelkerke's R^2 and the area under the receiver operating characteristic curve (AUC). Model calibration was assessed using the Hosmer-Lemeshow goodness-of-fit test. To improve interpretability, the effect of patient numbers per quarter year was re-expressed per 100 additional patients by multiplying the regression coefficient and standard error by 100 and exponentiating the resulting values.

Ethics approval was waived by the Chair of the Ethical Review Board for the Viennese Hospitals in the Vinzenz Holding because the study was an anonymous voluntary survey without collection of personal data. Participants received study information before accessing the questionnaire and consented electronically by proceeding to the survey.

The waiver was issued for an anonymous, voluntary, noninterventional online survey among EMS personnel. No patient data, IP addresses, cookies, employer identifying data, or directly identifying personal data were collected. Because the study did not involve an intervention, patient data, or identifiable regional employee data, no additional regional ethics approvals were sought.

Results

Sample characteristics

A total of 1171 questionnaires were included in the analysis. The sample was predominantly male (71.7%), with a mean age of 31.4 years (SD 11.5 years). Most participants were emergency medical technicians (51.8%), 64.1% worked on a volunteer basis, and 64.0% reported full-time employment at the time of the survey. The mean number of treated patients per quarter year was 145.1 (SD 176.2; median 80). Additional baseline characteristics are summarized in Table 1.

The EMS qualification categories shown in Table 1 are reported as qualification and competence categories. They can exceed 100% because emergency competences can be reported in addition to basic EMS qualification. The EMS activity model and working-time status were separate concepts and the regression model used professional versus volunteer EMS work.

Table 1 Selected baseline characteristics of the study sample

Characteristic	<i>n</i>	%
<i>Gender</i>		
Male	840	71.7
Female	324	27.7
Diverse	7	0.6
<i>EMS qualifications and competences</i>		
Emergency medical technician (Rettungssanitäter:in, RS)	607	51.8
Advanced emergency medical technician (Notfallsanitäter:in, NFS)	144	12.3
NKA, emergency drug administration competence	56	4.8
NKV, emergency venous access and infusion competence	290	24.8
NKI, emergency intubation and ventilation competence	122	10.4
<i>EMS activity model</i>		
Volunteer EMS work	751	64.1
Professional EMS work	420	35.9
<i>Current working-time status</i>		
Full-time	750	64.0
Part-time	421	36.0

Qualification and competence items were recorded as separate binary multiple-response indicators; respondents could report more than one category. Percentages use the full sample ($n=1171$) as the denominator and therefore do not sum to 100%. Terms refer to Austrian EMS qualification levels. EMS activity model distinguishes volunteer from professional EMS work. Current working-time status was assessed separately and should not be interpreted as identical to the EMS activity model.

EMS emergency medical services RS emergency medical technician, NFS advanced emergency medical technician, NKA emergency drug administration competence, NKV emergency venous access and infusion competence, NKI emergency intubation and ventilation competence

Prevalence, key events and support

Overall, 60.1% of respondents classified themselves as second victims. Among participants with valid information on the key event ($n=704$), the most frequent key event was unexpected patient death or patient suicide ($n=294$, 41.8%), followed by aggressive behavior by patients, relatives, or accompanying persons ($n=132$, 18.8%). Other key event categories were incidents

Table 2 Distribution of reported key events among participants with a second victim experience

Key event	<i>n</i>	Valid %
Incident with patient harm	71	10.1
Incident without patient harm/near miss	92	13.1
Unexpected patient death or patient suicide	294	41.8
Unexpected death or suicide of a colleague	23	3.3
Aggressive behavior by a patient, relative, or accompanying person	132	18.8
Other	92	13.1
Total valid	704	100.0

The analyzed key event variable contained predefined categories. Pediatric emergencies, HALO (high acuity, low occurrence) procedures, severe trauma, and obstetric or pregnancy-related emergencies were not available as separate categories in the analytic variable.

with patient harm ($n=71$, 10.1%), incidents without patient harm or near misses ($n=92$, 13.1%), unexpected death or suicide of a colleague ($n=23$, 3.3%), and other events ($n=92$, 13.1%). The full distribution is shown in Table 2.

The key event variable comprised predefined categories. Pediatric emergencies, high acuity, low occurrence (HALO) procedures, severe trauma, and obstetric or pregnancy-related emergencies were not available as separate predefined categories in the analyzed key event variable and therefore could not be reported separately. The use of the standardized SeViD questionnaire enables direct comparison between professional groups.

Exploratory univariate analyses using Mann-Whitney U-tests indicated significant differences in years of professional experience ($U=147,608.00$, $Z=-2.99$, $p=0.003$), patient numbers per quarter ($U=138,848.00$, $Z=-4.54$, $p<0.001$), neuroticism ($U=145,089.50$, $Z=-3.48$, $p<0.001$), and openness ($U=152,595.50$, $Z=-2.12$, $p=0.034$), all with higher mean ranks among second victims. Age, extraversion, agreeableness, and conscientiousness were not significantly associated with second victim status.

Support-related variables were evaluated descriptively and as candidate variables for the multivariable model. Of 704 participants with valid information on support after the key event, 422 (59.9%) reported that they had received support, 32 (4.5%) reported no support despite actively seeking help, and 250 (35.5%) reported that they had not asked anyone for help. Thus, 454 participants actively sought help; among them, 32 (7.0%) reported unmet support despite help-seeking. Details are provided in Table 3.

Among those who received support, colleagues were the most frequently reported source of support ($n=380$), followed by family or friends ($n=255$), pastoral care, psychological counselling or psychotherapy ($n=110$), and supervisors ($n=98$). Administrative or management support was reported less frequently ($n=10$), as shown in Table 4.

Factors associated with high symptom burden

After Holm correction, univariate screening identified gender, EMS activity model, patient numbers per quarter, neuroticism, openness, and absence of

Table 3 Support after the key event

Support after key event	<i>n</i>	Valid %
Yes, received support	422	59.9
No, despite actively seeking help	32	4.5
No, did not ask anyone for help	250	35.5
Total valid	704	100.0

Derived support indicator: 454 participants actively sought help; among these, 422 (93.0%) received support and 32 (7.0%) reported no support despite help-seeking.

Table 4 Reported sources of support among participants who received support.

Source of support	<i>n</i>	Approx. % among those who received support (<i>n</i> = 422)
Colleagues	380	90.0
Supervisors	98	23.2
Administration/management	10	2.4
Family/friends	255	60.4
Pastoral care/psychological counselling/psychotherapy	110	26.1
Multiple responses were possible; percentages therefore do not sum to 100%.		

support despite active help-seeking as candidate variables for the multivariable logistic regression model.

Metric variables were assessed with Mann-Whitney U tests and categorical variables with chi-square tests. For metric variables, Mann-Whitney U tests indicated higher mean ranks in the high symptom-burden group for patient numbers per quarter ($U = 51,311.50$, $Z = -3.87$, $p < 0.001$), neuroticism ($U = 50,073.50$, $Z = -4.40$, $p < 0.001$), and openness ($U = 54,791.00$, $Z = -2.60$, $p = 0.009$). Age, years of professional experience, extraversion, agreeableness, and conscientiousness were not significant, with all p values ≥ 0.105 .

The multivariable logistic regression model included 698 complete cases, of whom 336 had high symptom burden. With 13 model parameters, the events-per-parameter ratio was approximately 25.8. The overall logistic regression model was significant according to the omnibus test, $\chi^2(13) = 85.23$, $p < 0.001$. The model explained a modest proportion of variance (Cox & Snell $R^2 = 0.115$; Nagelkerke's $R^2 = 0.153$), and the Hosmer-Lemeshow test showed no evidence of poor model fit, $\chi^2(8) = 5.64$, $p = 0.688$. The model showed moderate discriminatory ability (AUC = 0.69)

and overall classification accuracy of 63.0%. It should not be interpreted as a predictive risk model for individual personnel.

Higher neuroticism was associated with higher odds of high symptom burden (OR = 1.44, 95% CI 1.19–1.75, $p < 0.001$), as was higher openness (OR = 1.21, 95% CI 1.04–1.41, $p = 0.015$). Patient numbers per quarter were re-expressed per 100 additional patients to improve clinical interpretability. An increase of 100 patients per quarter was associated with higher odds of high symptom burden (OR = 1.14, 95% CI 1.03–1.25, $p = 0.011$). Self-reported male gender was associated with lower odds of high symptom burden (OR = 0.62, 95% CI 0.43–0.88, $p = 0.009$). Professional EMS work compared with volunteer EMS work was associated with higher odds of high symptom burden (OR = 1.52, 95% CI 1.05–2.18, $p = 0.025$).

Support after the key event was significantly associated with high symptom burden overall ($p = 0.004$). Participants who reported no support despite actively seeking help had markedly higher odds of high symptom burden (OR = 5.98, 95% CI 1.99–17.98, $p = 0.001$). In contrast, not receiving support because no help was requested was not significantly associated with

Table 5 Multivariable logistic regression of factors associated with high overall symptom burden.

Variable	OR	95% CI	<i>p</i>
Neuroticism	1.44	1.19–1.75	< 0.001
Openness	1.21	1.04–1.41	0.015
Patient numbers per 100 additional patients per quarter	1.14	1.03–1.25	0.011
Self-reported male gender vs female	0.62	0.43–0.88	0.009
Professional EMS work vs volunteer EMS work	1.52	1.05–2.18	0.025
Prior awareness of the second-victim concept vs no prior awareness	0.73	0.52–1.02	0.063
<i>Key-event category, overall</i>	–	–	0.047
Other	0.89	0.51–1.57	0.694
Incident with patient harm	1.03	0.55–1.93	0.923
Incident without patient harm/near miss	1.22	0.69–2.16	0.485
Unexpected patient death or patient suicide	0.67	0.43–1.04	0.074
Unexpected death or suicide of a colleague	2.23	0.79–6.31	0.129
<i>Support after key event, overall</i>	–	–	0.004
No support despite help-seeking	5.98	1.99–17.98	0.001
No support because no help was requested	0.92	0.66–1.29	0.637

Dashes indicate that no single OR or CI applies to the overall categorical Wald test. The multivariable model included 698 complete cases and 336 participants with high symptom burden (13 estimated model parameters). The covariate set was conceptually defined; Holm-adjusted univariate significance was not used as an automatic criterion for model inclusion. Patient numbers were rescaled to 100 additional patients per quarter. Omnibus test $\chi^2(13) = 85.23$, $p < 0.001$; Cox and Snell $R^2 = 0.115$; Nagelkerke's $R^2 = 0.153$; Hosmer-Lemeshow $\chi^2(8) = 5.64$, $p = 0.688$; AUC = 0.69; overall classification accuracy = 63.0%. Reference categories were aggressive behavior by a patient, relative, or accompanying person for key-event category and received support for support after the key event. Because of the cross-sectional design, all estimates should be interpreted as associations, not causal effects.
EMS emergency medical services; OR odds ratio; CI confidence interval; AUC area under the receiver operating characteristic curve.

high symptom burden (OR=0.92, 95% CI 0.66–1.29, $p=0.637$). Key model coefficients are displayed in Table 5.

Discussion

This study provides the first nationwide quantitative evidence on second-victim experiences among Austrian nonphysician emergency medical services personnel. The findings show that second-victim experiences are common, that key events are dominated by unexpected patient death or suicide and aggression, and that high symptom burden was associated with event-related, individual, workload-related, employment-related, and support-related factors. In practical terms, the burden of critical incidents in prehospital care should not be framed as an individual coping problem alone, but as a patient-safety and staff-safety issue requiring organizational attention.

The observed prevalence of 60.1% places Austrian nonphysician EMS personnel within the range reported across the German-speaking SeViD program [15–22]. Most importantly, the result aligns with findings from other parts of the prehospital rescue chain, including emergency medical services physicians, emergency medical dispatchers, and German emergency medical technicians [17, 21, 22]. This supports the interpretation that second-victim experiences are not restricted to one professional group or one care setting but occur across the emergency-care continuum. International literature further supports the broader relevance of second-victim experiences for symptoms, work-related outcomes, and patient-safety behavior [3–7].

The event profile is particularly informative. Unexpected death or suicide and aggression from patients or relatives are not merely frequent events. They represent typical prehospital burden constellations characterized by high emotional intensity, low controllability, limited preparation, immediate confrontation with suffering or death, and often restricted opportunities for structured follow-up. This helps explain why second-victim experiences in EMS may arise not only after preventable patient-safety incidents, but also after existentially distressing missions in which the outcome could not be controlled by the responding team. Patient-safety studies in prehospital care have emphasized the complexity of safety incidents, adverse events, and clinical decision-making under uncertainty, which reinforces the relevance of the EMS environment as a high-risk setting for both patients and professionals [10–14].

The associations with neuroticism and openness should be interpreted as indicators of differential vulnerability rather than as deterministic individual risk profiles. Higher neuroticism is consistent with greater stress reactivity described in previous SeViD studies and in broader psychological literature [15–22]. The association between openness and high symptom

burden should be interpreted cautiously. One possible explanation is that individuals with higher openness may process critical incidents more intensively, but this interpretation is exploratory and cannot be confirmed by the present cross-sectional data. Work-related factors also matter. Higher patient numbers and professional EMS work may reflect greater cumulative exposure and fewer opportunities for recovery. The lower odds among men should be interpreted cautiously, because gender differences may reflect reporting patterns, perceived stigma, social role expectations, willingness to disclose psychological distress, help-seeking behavior, or unmeasured differences in exposure rather than biological vulnerability.

The most practically important finding is the almost sixfold higher odds of high symptom burden among participants who reported no support despite actively seeking help. This finding should be understood as an organizational support gap. The critical issue is not only whether support structures formally exist, but whether affected personnel know about them, can access them quickly, experience them as acceptable and non-stigmatizing, and receive a response that is helpful. This interpretation is consistent with second-victim support literature showing the importance of peer support, timely follow-up, clear communication pathways, and organizational commitment after serious events [8, 9, 23–25]. Because help-seeking, perceived support, and symptom burden were assessed at the same time, reverse causation cannot be excluded. Participants with higher symptom burden may have been more likely to perceive support as absent or insufficient. Therefore, this association should be interpreted as an important support-related correlate of symptom burden, not as evidence that lack of support causally produced high symptom burden.

Although the overall model was statistically significant, Nagelkerke's R^2 of 0.153 indicates that a substantial proportion of variance in symptom burden remained unexplained. Additional factors not assessed in the present study may therefore be important.

The Austrian EMS context adds an important structural dimension. Because the sample included both volunteer and professional personnel, support pathways must be operationally realistic for different employment models. Professional EMS personnel may have greater cumulative exposure and higher patient volumes, whereas volunteers can be less consistently embedded in formal organizational support structures.

These mechanisms are not mutually exclusive. Support systems in Austrian EMS should therefore be designed for both groups, with low-threshold access, proactive outreach after severe events, clear escalation pathways, and explicit protection against stigmatization. Because civil service personnel were not available as a separate analytic category, the present study cannot determine whether this subgroup differs

in exposure, symptom burden, or support needs. This should be addressed in future Austrian EMS studies. Several practical implications follow from these findings. First, second victim awareness should be integrated into EMS training, leadership development, and postincident routines. Second, events involving unexpected death, patient suicide, severe pediatric emergencies, aggression, or perceived patient harm should trigger structured but noncoercive follow-up. Third, peer-support systems should be visible, confidential, and available outside ordinary working hours. Fourth, organizations should monitor whether staff who actively seek help receive it, because unmet help-seeking appears to identify a group with particularly high odds of high symptom burden.

These implications should be regarded as hypothesis-generating. Prospective and interventional studies are needed before causal effects of specific organizational interventions can be inferred.

Limitations

This study has several limitations. The cross-sectional design precludes causal inference, and all associations should therefore be interpreted as correlational. Participation was voluntary and survey-based, which may have introduced self-selection bias and limits the generalizability of prevalence estimates. The representativeness of the sample for all Austrian nonphysician EMS personnel cannot be fully ensured, particularly regarding regional differences, organizational structures, qualification levels, and professional versus volunteer personnel. Comprehensive national reference data stratified by qualification level, employment model, civil service status, organization, and federal state were not available. Therefore, these findings must be tempered by our inability to verify representativeness against national benchmarks, alongside a moderate model fit ($AUC=0.69$, $R^2=0.153$) that restricts individual-level risk assessment.

All key variables were self-reported and may have been affected by recall bias, social desirability, and subjective interpretation of second victim status, key events, symptom burden, and support availability. The dichotomization of second victim status and the median split of symptom burden reduced the complexity of the underlying constructs and may have affected statistical power and effect estimates. The present manuscript focused on a dichotomized high symptom-burden endpoint. Finally, potentially relevant contextual factors such as leadership culture, team climate, routine debriefing practices, mission types, and previous traumatic experiences could not be fully accounted for.

The study's limitations include potential selection bias from professional newsletter recruitment. The EMS personnel with previous second victim experiences, current psychological distress, or particular interest in peer support, mental health, or patient safety

may have been more likely to participate. Conversely, highly burdened individuals may also have avoided participation. Both mechanisms could have affected prevalence estimates and associations.

Furthermore, the analysis was restricted by the omission of key confounders (e.g., previous psychiatric history, cumulative traumatic exposure, previous traumatic life events, organizational culture, leadership behavior, team climate), the simplification of symptom burden through a median split, and the aggregation of diverse volunteer and professional personnel. These factors, particularly the lack of stratified comparisons across work models, indicate that the results represent a large Austrian sample rather than precise national population estimates. Another limitation concerns the regression model-building strategy, in which independent variables were selected based on contextual relevance and the results of univariate analyses. Although this approach is commonly used, prescreening variables in this manner can increase model instability, introduce selection bias, and exclude potentially relevant variables that could become important only after adjustment for other covariates.

Conclusion

Second victim experiences are frequent among Austrian nonphysician emergency medical services personnel and are associated with relevant symptom burden in a substantial subgroup. The findings indicate that psychological burden after critical incidents in prehospital care is shaped by event characteristics, workload, individual vulnerability, and especially the responsiveness of organizational support. Because of the cross-sectional design, these findings should be interpreted as associations rather than causal determinants. A strengthened peer-support culture, timely access to help after severe events, and reliable pathways for those who actively seek support are plausible organizational targets, but their effectiveness requires prospective and interventional evaluation. Future longitudinal studies are needed to clarify temporal relationships, identify causal determinants of symptom burden, and evaluate whether structured peer-support interventions reduce persistent distress after critical incidents.

Acknowledgements The authors thank the participating emergency medical services personnel and the *Bundesverband Rettungsdienst* (Federal Rescue Service) for supporting distribution of the survey.

Author Contribution KT drafted the manuscript and contributed to the interpretation of the findings. VK performed the statistical analyses and contributed to data interpretation. HH and EP contributed to the study design and conceptual development of the project. SD contributed to critical revision of the manuscript and refinement of the final version. RS provided senior academic supervision and methodological oversight. All authors critically reviewed the manuscript,

contributed to its intellectual content, and approved the final version for submission.

Funding No external funding was reported for the present analysis.

Open access funding provided by Medical University of Vienna.

Data availability The data underlying the findings of this study are available from the corresponding author upon reasonable request, subject to applicable ethical and data protection requirements.

Declarations

Ethical standards Ethical approval was waived by the Chair of the Ethical Review Board for the Viennese Hospitals in the Vinzenz Holding (Ethical approval 1/2024; clearance dated 01/03/2024) because the study was an anonymous voluntary survey without collection of personal data. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Participants received study information before accessing the questionnaire and provided electronic informed consent by proceeding to the survey. The study was an anonymous, voluntary, noninterventional online survey among EMS personnel and did not collect patient data, IP addresses, cookies, employer-identifying data, or directly identifying personal data. Therefore, no additional regional ethics approvals were sought. Electronic informed consent was obtained from all participants before survey completion.

Conflict of interest K. Tscherny, V. Klemm, H. Huscsava, S. Dür, E. Potura and R. Strametz declare that they have no competing interests.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

1. Wu AW. Medical error: the second victim. The doctor who makes the mistake needs help too. *BMJ*. 2000;320(7237):726–7.
2. Vanhaecht K, Seys D, Russotto S, et al. An evidence and consensus-based definition of second victim: a strategic topic in healthcare quality, patient safety, person-centeredness and human resource management. *Int J Environ Res Public Health*. 2022;19(24):16869.
3. Waterman AD, Garbutt J, Hazel E, et al. The emotional impact of medical errors on practicing physicians in the United States and Canada. *Jt Comm J Qual Patient Saf*. 2007;33(8):467–76.
4. Seys D, Wu AW, Van Gerven E, et al. Health care professionals as second victims after adverse events: a systematic review. *Eval Health Prof*. 2013;36(2):135–62.
5. Busch IM, Moretti F, Purgato M, et al. Psychological and psychosomatic symptoms of second victims of adverse events: a systematic review and meta-analysis. *J Patient Saf*. 2020;16(2):e61–e74.
6. Burlison JD, Quillivan RR, Scott SD, et al. The effects of the second victim phenomenon on work-related outcomes: connecting self-reported caregiver distress to turnover intentions and absenteeism. *J Patient Saf*. 2021;17(3):195–9.
7. Panella M, Rinaldi C, Leigh F, et al. The determinants of defensive medicine in Italian hospitals: the impact of being a second victim. *Rev Calid Asist*. 2016;31(Suppl 2):20–5.
8. Scott SD, Hirschinger LE, Cox KR, et al. Caring for our own: deploying a systemwide second victim rapid response team. *Jt Comm J Qual Patient Saf*. 2010;36(5):233–40.
9. Mira JJ, Carillo I, Tella S, et al. The European Researchers' Network Working on Second Victim (ERNST) policy statement on the second victim phenomenon for increasing patient safety. *Public Health Rev*. 2024;45:1607175.
10. Bigham BL, Buick JE, Brooks SC, et al. Patient safety in emergency medical services: a systematic review of the literature. *Prehosp Emerg Care*. 2012;16(1):20–35.
11. O'Connor P, O'Malley R, Oglesby AM, et al. Measurement and monitoring patient safety in prehospital care: a systematic review. *Int J Qual Health Care*. 2021;33(1):mzab013.
12. O'Connor P, O'Malley R, Lambe K, et al. How safe is prehospital care? A systematic review. *Int J Qual Health Care*. 2021;33(4):mzab138.
13. Hagiwara MA, Magnusson C, Herlitz J, et al. Adverse events in prehospital emergency care: a trigger tool study. *BMC Emerg Med*. 2019;19(1):14–14.
14. Bijani M, Abedi S, Karimi S, et al. Major challenges and barriers in clinical decision-making as perceived by emergency medical services personnel: a qualitative content analysis. *BMC Emerg Med*. 2021;21(1):11.
15. Strametz R, Koch P, Vogelgesang A, et al. Prevalence of second victims, risk factors and support strategies among young German physicians in internal medicine (SeViD-I survey). *J Occup Med Toxicol*. 2021;16(1):11–11.
16. Strametz R, Fendel JC, Koch P, et al. Prevalence of second victims, risk factors, and support strategies among German nurses (SeViD-II survey). *Int J Environ Res Public Health*. 2021;18(20):10594.
17. Marung H, Strametz R, Roesner H, et al. Second victims among German emergency medical services physicians (SeViD-III-Study). *Int J Environ Res Public Health*. 2023;20(5):4267.
18. Potura E, Klemm V, Roesner H, et al. Second victims among Austrian pediatricians (SeViD-A1 Study). *Healthcare (Basel)*. 2023;11(18):2501.
19. Potura E, Roesner H, Trifunovic-Koenig M, et al. Second victims among Austrian nurses (SeViD-A2 Study). *Healthcare (Basel)*. 2024;12(20):2061.
20. Klemm V, Potura E, Fuerst S, et al. The second victim phenomenon among midwives in Austria (SeViD-A3): a cross-sectional study. *Eur J Midwifery*. 2025;9:34.
21. Klemm V, Strametz R, Neusius T, et al. Second victims among emergency medical dispatchers in Germany: a cross-sectional study (SeViD-VII). *Int J Emerg Med*. 2026;19:27–27.
22. Marung H, Klemm V, Strametz R, et al. The second victim phenomenon among German emergency medical technicians: a cross-sectional study based on the SeViD questionnaire (SeViD-VIII). *BMC Emerg Med*. 2025;25:137.
23. Scott SD, Hirschinger LE, Cox KR, et al. The natural history of recovery for the healthcare provider "second

- victim” after adverse patient events. *Qual Saf Health Care*. 2009;18(5):325–30.
24. Mira JJ, Lorenzo S, Carrillo I, et al. Interventions in health organisations to reduce the impact of adverse events in second and third victims. *BMC Health Serv Res*. 2015;15:341.
 25. Kappes M, Romero-García M, Delgado-Hito P. Coping strategies in health care providers as second victims: a systematic review. *Int Nurs Rev*. 2021;68(4):471–81.
 26. Strametz R, Rösner H, Ablöcher M, et al. Entwicklung und Validation eines Fragebogens zur Beurteilung der Inzidenz und Reaktionen von Second Victims im deutschsprachigen Raum (SeViD). *Zentralbl Arbeitsmed Arbeitsschutz Ergon*. 2021;71(1):19–23.
 27. Rammstedt B, Kemper CJ, Klein MC, et al. Eine kurze Skala zur Messung der fünf Dimensionen der Persönlichkeit: Big-Five-Inventory-10 (BFI-10). *Methoden Daten Analysen*. 2013;7(2):233–49.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.