



Identifying risk of emotional sequelae after critical incidents

Janice Halpern,¹ Robert G Maunder,¹ Brian Schwartz,² Maria Gurevich³

¹Department of Psychiatry, Mt Sinai Hospital and University of Toronto, Toronto, Canada

²Sunnybrook-Osler Centre for Prehospital Care and Department of Family and Community Medicine, University of Toronto, Toronto, Canada

³Department of Psychology, Ryerson University, Toronto, Canada

Correspondence to

Dr Janice Halpern, Department of Psychiatry, Mt Sinai Hospital and University of Toronto, 244 Dupont Street, Toronto, Ontario, Canada M5R 1V7; Janice.halpern@utoronto.ca

Accepted 31 December 2009
Published Online First
29 May 2010

ABSTRACT

Background and purpose Ambulance workers could benefit from a method for early identification of incidents likely to result in long-term emotional sequelae. There is evidence that persistence of some measures of anxiety beyond the first week after an incident is associated with sequelae. In this study we test the hypothesis that persistence of self-identifiable components of the acute stress reaction as early as a few days post-incident is associated with sequelae.

Method 228 ambulance workers volunteered to complete surveys on occurrence and persistence of physiological, behavioural and emotional responses to an index critical incident in the past, as well as symptoms of depression, post-traumatic stress, somatisation and burnout at the time of the survey. Data were analysed for associations between duration of each reaction and present symptoms. Using cut-off scores for the outcomes, we tested the RR of high scores in each of three situations: occurrence of the reaction, persistence of reaction beyond one night and persistence beyond 1 week.

Results Prolonged duration of all five acute stress reaction components was associated with all four outcomes, with the strongest associations being with post-traumatic stress and depression symptoms. The occurrence of physical symptoms of arousal is an immediate predictor of long-term sequelae. Three other components—disturbed sleep, irritability and social withdrawal—provide potential indicators of long-term emotional sequelae as early as 2 days post-incident.

Conclusion Four easily identifiable responses to a critical incident can potentially be used for early self-identification of risk of later emotional difficulties. These findings should be submitted to prospective testing.

BACKGROUND AND PURPOSE

Ambulance workers frequently encounter stressful or 'critical' incidents that can result in significant emotional sequelae, such as depression and post-traumatic stress symptoms¹ and burnout.² Somatisation, the expression of emotional difficulties through somatic symptoms, has also been reported in ambulance workers.³ Early identification of incidents that are likely to have later sequelae would potentially facilitate early intervention, which would help maintain operational readiness. Ambulance workers are often reluctant to report emotional distress for a number of reasons, such as difficulty identifying emotions, shame at feeling distressed and fear of stigma.⁴ There is some evidence that both intensity of distress⁵ and its persistence in the early post-incident period⁶ predict later sequelae. There is also evidence that persistence of anxiety,⁷ insomnia⁸ and increased heart rate⁹ beyond the first week are

associated with later sequelae. The acute stress reaction (ASR)^{10 11} is a response to exceptional stress that usually lasts 2–3 days. In this study we test the hypothesis that the post-incident occurrence and persistence of five common and self-identifiable components of the ASR is associated with the risk of later sequelae.

METHOD

Participants and procedure

Ambulance workers, both front-line and supervisors, were recruited from attendees of a mandatory continuing medical education programme in a large urban Emergency Medical Services organisation. A recruitment letter informed ambulance workers on leave. Subjects completed their choice of paper or web-based survey. Participants' names were entered into a draw for monthly prizes worth up to \$600. Nine hundred and six ambulance workers were informed of the study. Of the 635 who signed consent forms, 243 completed the questionnaire package, and 228 (36%) provided usable data on recovery from at least one ASR component. Research ethics board approval was obtained.

The 228 participants in this analysis included 146 (64%) men and 81 (36%) women (one not answered). Mean age was 37.5 (SD 9.3, range 22–59). Level of training (beginning with basic) was distributed as 96 (42%) level 1, 41 (18%) level 2, 83 (36%) level 3, 4 (2%) supervisors, 4 (2%) not answered. Mean years of service were 7.6 (SD 3.3, range 1–12). Seventy-five (33%) were single, 138 (61%) married or common-law and 14 (6.1% divorced or separated; 1 not answered). These demographics were representative of the organisation, except that female gender and highest level of training were over-represented. In the organisation, 24% of ambulance workers are female and 25% have level 3 training.

Instruments

Critical incidents

We asked participants how many critical incidents they had experienced. We defined critical incidents as 'calls that have generated unusually strong feelings, either because of the incident itself, or how it was handled or some other reason'. In order to identify an index incident, participants were asked to identify an incident that was 'still troubling'. Those who could not identify a still troubling incident were asked to identify an incident that 'had been troubling in the past'. Failing this, they were asked to describe 'a composite of a number of critical incidents'. Finally, those who were unable to describe a composite were asked to describe 'one of your worst calls'. We also inquired about how

Prehospital care

long ago the index incident took place, or over what time period in the case of the composite.

Duration of reactions to critical incident

We measured five components of the ASR in response to the index critical incident. The components measured were physical reactions ('like sweating, shaking and pounding heart'), distressing feelings ('like fear, anger, horror, guilt, shame worry or sadness'), disturbed sleep ('sleep disrupted by the incident'), irritability ('irritable, mean or snappish') and social withdrawal ('if you withdrew or pulled back from other people'). For each dimension, participants reported the occurrence in response to the incident and how long it took to get back to normal by choosing one of seven options: (i) did not have this reaction; or returned to normal (ii) soon after the call (a few hours), (iii) by the next night, (iv) by the next week, (v) by the next month, (vi) within a few months or (vii) still not normal.

Psychological symptoms at time of the survey

Centre for Epidemiological Studies Depression Scale, short form

This 10-item scale is the short version of the CES-D. Responses rated the frequency of depressive phenomena on a four-point scale from 0 (rarely or none of the time, less than 1 day) to 3 (all of the time, 5–7 days). The scale is scored as the sum of all item scores. CES-D-10 scores show concurrent validity with measures of positive affect ($r=-0.63$) and poor health status ($r=0.37$). The 10-item scale is highly correlated with the CES-D, which has been validated against clinical diagnoses of depression.¹² The cut-off score for the CES-D has been validated with and the *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition (DSM-IV), major depression. The CESD-10 cut-off score of 10 discriminates consistently with the cut-off score for the original.¹³ Internal reliability was 0.77.

Impact of Events Scale-Revised (IES-R)

This 22-item measure of traumatic stress probes the intensity of responses to a particular event on a 5-point scale from 0 (not at all) to 4 (extremely). The scale is scored as the mean of item scores. The IES-R yields three subscales (avoidance, intrusion and hyperarousal) and a total score. The three subscales have strong internal consistency and satisfactory test-retest reliability.¹⁴ The correlation between the Mississippi Scale for Combat-Related PTSD, Civilian Version and the three subscales of the IES-R were: Intrusion, $r=0.53$, Avoidance, $r=0.55$ and Hyperarousal, $r=0.55$.¹⁵ A cut-off of ≥ 1.5 has been used to identify possible cases. Internal reliability for total scale was 0.91.

Brief Symptom Inventory (BSI) somatisation subscale

The BSI is abbreviated from the Symptom Checklist 90-Revised. The seven-item somatisation scale probes how much the participant was distressed by the discomfort of a physical symptom using a 5-point scale, from 0 ('not at all') to 3 ('extremely'). The SCL-90 has demonstrated reliability and validity.¹⁶ The BSI-somatisation scale has been validated against the SCL-90R and comparable scales of the MMPI. To identify cases, a cut-off was set at the value of the mean +1 SD in a non-psychiatric patient normative sample (cut-off=0.69).¹⁷ Internal reliability was 0.79.

The time period for the three scales above was altered from the standard 'over the last week' to 'your current or most recent block of shifts on duty' because in a pilot study ambulance

Table 1 Data on all critical incidents experienced and the index critical incident

	No	%
Number of critical incidents experienced	220	
None	7	3%
1–5	145	66%
6–10	21	10%
>10	47	21%
Types of index critical incident	225	
Still troubling	119	53%
Troubled in the past	86	38%
Difficult to isolate (compositae)	4	2%
Worst call	16	7%
Time elapsed since index critical incident	201	
<1 month	12	6%
≤6 months	23	11%
6 months–1 year	18	9%
1–5 years	90	45%
6–10 years	27	13%
>10 year	31	15%

workers reported that psychological distress was worse during blocks of shifts on than during time off.

Maslach Burnout Inventory Human Services Survey-Emotional Exhaustion scale

This questionnaire enquires about present job-related feelings. Responses describe the frequency of phenomena in seven categories from 1 (never) to 7 (every day). There is strong psychometric evidence of both reliability and validity for three subscales. A cut-off of 27 on the 9-item emotional exhaustion subscale was used to identify burnout, based on the recommendations of the scale's authors.¹⁸

Data analysis

The independent variables in this analysis were the occurrence and persistence of five components of the ASR in response to the index critical incident. Time to recovery was measured with a seven-category ordinal variable, in which responses were ordered chronologically but with variable time periods between categories. Recovery curves were plotted as the percentage of participants not yet recovered at each time point. Spearman's rank order correlations were calculated to measure the association between five ASR component recovery trajectories and four measures of current psychological symptoms (depressive symptoms, post-traumatic stress symptoms, professional burnout, somatisation symptoms).

To determine if specific durations of components were associated with risk of subsequent high psychological distress,

Table 2 Occurrence and persistence of five components of the ASR after an index critical incident

Component of acute stress reaction	No		Persistence beyond the next night	Persistence beyond the next week
	No	Occurrence		
Distressing feelings	217	191 (88%)	121 (56%)	82 (38%)
Disrupted sleep	223	139 (62%)	102 (45%)	48 (22%)
Social withdrawal	221	116 (53%)	67 (30%)	33 (15%)
Irritability	221	102 (46%)	67 (30%)	33 (15%)
Physical reactions	218	106 (49%)	20 (9%)	13 (6%)

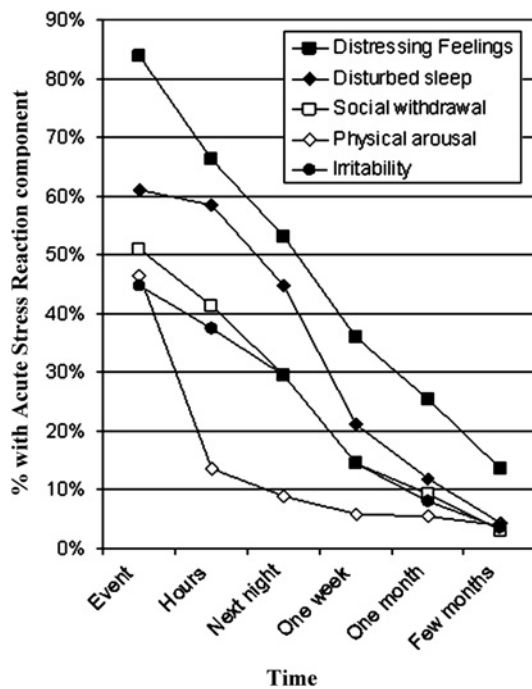


Figure 1 Time to recovery from five components of acute stress reaction.

outcome variables were dichotomised using cut-off scores. Component recovery scores were also recoded into dichotomous variables. Three time-based cut-offs were tested: occurrence of component (any/none), persistence of component after one

night (yes/no), persistence of component after 1 week (yes/no). For each dimension of component recovery, we tested the RR and OR of high depressive, post-traumatic, burnout and somatisation symptoms at each of these three time points. Significance was set at $p < 0.05$, two-sided tests. Statistics were performed with SPSS (16.0) and with online calculators of risk metrics.¹⁹

RESULTS

Critical incidents

Data on number, types and time elapsed since the index critical incident are presented in table 1.

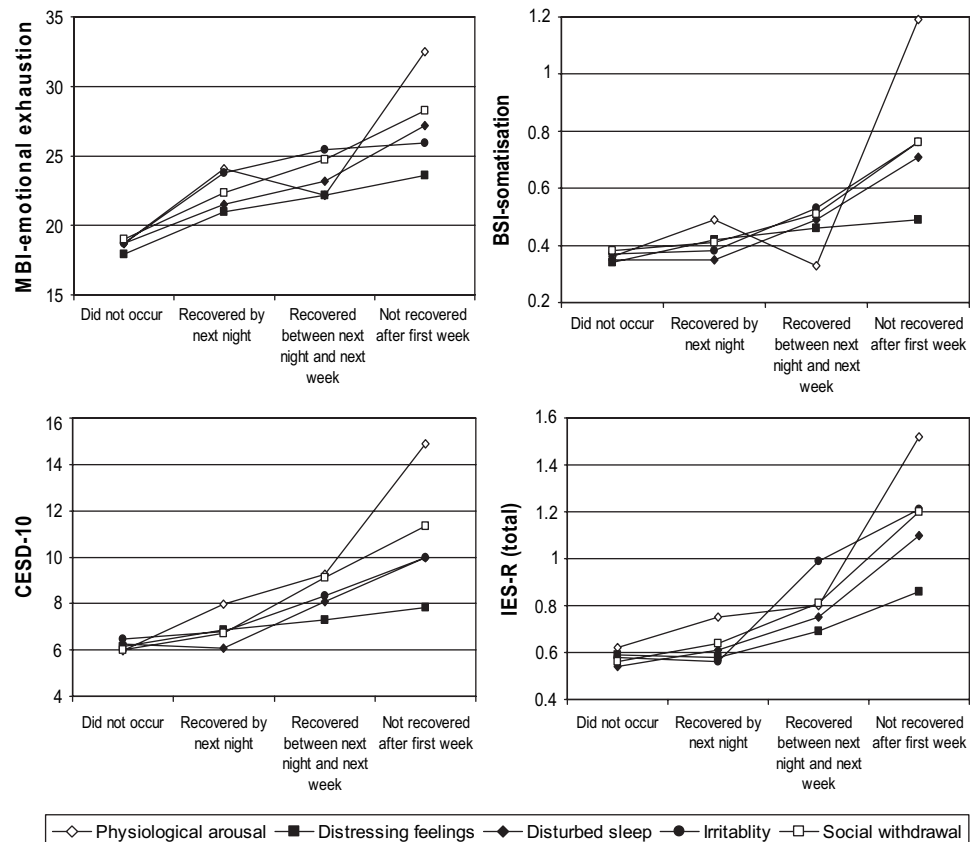
Distribution of symptom scores

Depressive symptom scores (CESD-10) were approximately normally distributed (mean 7.4 ± 4.5). When completing the IES-R, 56 participants (25%) identified the index event as a critical incident, 126 (55%) indicated some other experience and 46 (20%) did not specify an event. Post-traumatic symptom scores were non-parametrically distributed and skewed towards the minimum score (median 0.7, interquartile range 0.3–1.0). Somatisation symptom scores (BSI-somatisation) were non-parametrically distributed and skewed towards the minimum score (median 0.36, interquartile range 0.18–0.64). Burnout scores (MBI-EE) were approximately normally distributed (mean 21.9 ± 11.5).

Occurrence of ASR components and timing of recovery

Data on the frequency of the five types of ASR components, and time to recover from them are presented in table 2, and illustrated in figure 1.

Figure 2 Relation between recovery from acute stress reaction components and subsequent psychological distress.



Prehospital care

Relation of duration of ASR components to psychological symptoms

Time to recover from ASR components was significantly and positively correlated with current psychological distress for each of depressive symptoms, post-traumatic symptoms, somatisation symptoms and professional burnout (figure 2). The strength of this correlation was weak for recovery from distressing feelings (Spearman's ρ ranging from 0.15 to 0.22 for four psychological outcomes) and weak to moderate for recovery from each other component (Spearman's ρ ranging from 0.23 to 0.36, all $p < 0.05$).

Among the participants of this study, high depressive score (CESD-10 ≥ 10) was present in 55 (24%), burnout (MBI-emotional exhaustion ≥ 17) was present in 67 (29%), high post-traumatic symptoms (IES-R ≥ 1.5) were present in 19 (8%) and high somatisation symptoms (BSI-somatisation ≥ 0.69) were present in 36 (16%). For each dimension of recovery, we tested the RR and OR of high symptom scores at three time points: (i) any occurrence (ii) persisting at least one night, and (iii) persisting at least 1 week. The RR of post-traumatic symptoms (table 3) increases dramatically if any of the components persist beyond one night. The increase in RR ranged from more than doubling (RR=2.4 for distressing feelings) to an almost eightfold

increase (RR=7.9 for social withdrawal). RR of high post-traumatic symptoms is highest using the 1-week criterion for each component of recovery.

Table 4 shows that physical reactions, disrupted sleep, irritability and social withdrawal are each associated with at least a doubling of the RR of high depressive symptoms if they persist beyond one night. The RR associated with these components is not substantially higher when a 1-week persistence criterion is used. The presence of any (ie even non-persistent) physical reactions more than doubles the risk of high depressive symptoms (RR=2.6), but RR is not higher with more persistent reactions.

The RR of somatisation and burnout with delayed recovery from ASR components follows a similar pattern but the relation is not as strong. RR of high somatisation is approximately doubled if components last more than one night for all components except distressing feelings, which do not contribute to risk. RR does not increase appreciably beyond the one night criterion. With respect to burnout, there is a modest relation (RR from 1.6 to 2.2) between the occurrence of physical reactions, irritability, disturbed sleep, social withdrawal and burnout symptoms, but the risk does not increase as appreciably over time. For each psychological outcome ORs (the odds of a high symptom score/

Table 3 Persistence of reactions to critical incidents and risk of high post-traumatic stress symptoms

	Total No	High PTSD symptoms		RR* (95% CI)	OR† (95% CI)
		No	%		
Physical reactions					
None	95	6	6.3		
Any	88	11	12.5	2.0 (0.8 to 5.1)	2.1 (0.7 to 6.0)
Not persisting after one night	169	11	15.9		
Persisting after one night	14	6	42.9	6.6 (2.9 to 15.1)	10.8 (3.2 to 36.6)
Not persisting after 1 week	173	11	6.3		
Persisting after 1 week	10	6	60.0	9.4 (4.4 to 20.3)	22.1 (5.4 to 90.0)
Distressing feelings					
None	20	2	10.0		
Any	162	14	8.6	0.9 (0.2 to 3.5)	0.9 (0.2 to 4.1)
Not persisting after one night	81	4	4.9		
Persisting after one night	101	12	11.9	2.4 (0.8 to 7.2)	2.6 (0.8 to 8.4)
Not persisting after 1 week	114	5	4.4		
Persisting after 1 week	68	11	16.2	3.7 (1.3 to 10.2)	4.2 (1.4 to 12.7)
Disturbed sleep					
None	69	4	5.8		
Any	117	13	11.1	1.9 (0.7 to 5.6)	2.0 (0.6 to 6.5)
Not persisting after one night	103	4	3.9		
Persisting after one night	83	13	15.7	4.0 (1.4 to 11.9)	4.6 (1.4 to 14.7)
Not persisting after 1 week	149	6	4.9		
Persisting after 1 week	37	11	29.7	7.4 (2.9 to 18.7)	10.1 (3.4 to 29.7)
Irritability					
None	103	5	4.9		
Any	82	13	15.9	3.3 (1.2 to 8.8)	3.7 (1.3 to 10.8)
Not persisting after one night	135	6	4.4		
Persisting after one night	50	12	24.0	5.4 (2.1 to 13.6)	6.8 (2.4 to 19.3)
Not persisting after 1 week	161	9	5.6		
Persisting after 1 week	24	9	37.5	6.7 (3.0 to 15.2)	10.1 (3.5 to 29.4)
Social withdrawal					
None	87	5	5.7		
Any	98	11	11.2	2.0 (0.7 to 5.4)	2.1 (0.7 to 6.2)
Not persisting after one night	132	6	4.5		
Persisting after one night	53	10	18.9	7.9 (4.2 to 10.8)	4.9 (1.7 to 14.2)
Not persisting after 1 week	160	7	4.4		
Persisting after 1 week	25	9	36.0	8.2 (3.4 to 20.1)	12.3 (4.0 to 37.5)

*Probability of high IES-R score when the reaction criterion occurs/Probability of high score when criterion does not occur.

†Probability of high IES-R score when the reaction criterion occurs/Probability of low IES-R score when the criterion occurs.

Table 4 Persistence of reactions to critical incidents as predictors of high depressive symptoms

	Total No	High depressive symptoms		RR* (95% CI)	OR† (95% CI)
		No	%		
Physical reactions					
None	99	15	15.2		
Any	93	36	38.7	2.6 (1.5 to 4.3)	3.5 (1.8 to 7.1)
Not persisting after one night	178	42	23.6		
Persisting after one night	14	9	64.3	2.7 (1.7 to 4.4)	5.8 (1.9 to 18.3)
Not persisting after 1 week	182	43	23.6		
Persisting after 1 week	10	8	80.0	3.4 (2.3 - 5.1)	12.9 (2.6 - 63.2)
Distressing feelings					
None	21	5	23.8		
Any	170	46	27.1	1.1 (0.5 to 2.5)	1.2 (0.4 to 3.4)
Not persisting after one night	85	19	22.4		
Persisting after one night	106	32	30.2	1.4 (0.8 to 2.2)	1.5 (0.8 to 2.9)
Not persisting after 1 week	120	30	25.0		
Persisting after 1 week	71	21	29.6	1.2 (0.7 to 1.9)	1.3 (0.7 to 2.4)
Disturbed sleep					
None	75	13	17.3		
Any	121	40	33.1	1.9 (1.1 to 3.3)	2.4 (1.2 to 4.8)
Not persisting after one night	110	19	17.2		
Persisting after one night	86	34	39.5	2.3 (1.4 to 3.7)	3.1 (1.6 to 6.0)
Not persisting after 1 week	159	34	21.4		
Persisting after 1 week	37	19	51.4	2.4 (1.6 to 3.7)	3.9 (1.8 to 8.2)
Irritability					
None	109	23	21.1		
Any	86	29	33.7	1.6 (1.0 to 2.6)	1.9 (1.0 to 3.6)
Not persisting after one night	142	30	21.1		
Persisting after one night	53	22	41.5	2.0 (1.3 to 3.1)	2.6 (1.3 to 5.2)
Not persisting after 1 week	169	39	23.1		
Persisting after 1 week	26	13	50.0	2.2 (1.4 to 3.5)	3.3 (1.4 to 7.8)
Social withdrawal					
None	93	16	17.2		
Any	102	36	35.3	2.1 (1.2 to 3.4)	2.6 (1.3 to 5.1)
Not persisting after one night	140	25	17.9		
Persisting after one night	55	27	49.1	2.7 (1.8 to 4.3)	4.4 (2.2 to 8.8)
Not persisting after 1 week	170	37	21.8		
Persisting after 1 week	25	15	60.0	2.8 (1.8 to 4.2)	5.4 (2.2 to 3.0)

*Probability of high depressive score when the reaction criterion occurs/Probability of high depressive score when criterion does not occur.

†Probability of high depressive score when the reaction criterion occurs/Probability of low depressive score when the criterion occurs.

the odds of a low symptom score when the criterion is met) are somewhat higher than RR but occur in essentially the same pattern.

DISCUSSION

Among ambulance workers, the duration of ASR components after a critical incident is associated with poor long-term psychological outcomes. Longer duration of recovery for each of the five components was most strongly associated with increased risk of post-traumatic stress symptoms, and the recovery duration for four components was also strongly associated with depression symptoms. The recovery duration of components was more weakly associated with the prevalence of somatisation symptoms, and least to burnout. Despite the somewhat weak association of recovery duration of components with somatisation symptoms, the RR of somatisation symptoms is nonetheless doubled if some of the components persist beyond one night post-incident. This suggests that the association of somatisation with critical incidents, a subject that has not been previously studied, deserves further attention. Burnout may have the weakest association with post-critical incident recovery because it is caused by many factors, including chronic workplace stressors.

There are four signs of acute stress that can be identified within 2 days of a critical incident that are associated with at least a doubling of the RR of high post-traumatic, depressive and somatisation symptoms. These are the occurrence of any physical arousal symptoms or the persistence of insomnia, irritability or social withdrawal beyond one night post-incident. The potential for recognising by the second post-incident day that the risk of long-term psychological sequelae is high has substantial appeal because swift identification presents the possibility of early intervention such as workplace support and possibly cognitive-behavioural therapy.²⁰ This will be valuable for ambulance workers who, as a group, have difficulty identifying critical incidents and prefer intervention soon after the incident. Furthermore, the signs and symptoms that indicate elevated risk are physiological and behavioural, which appear to be more readily identifiable than emotions for ambulance workers. Self-identification may reduce the stigma and loss of control involved in organisational screening.

Study limitations and future directions

While the association of prolonged reactions to critical incidents and subsequent psychological symptoms is consistent with

Prehospital care

a causal relation, the study design precludes drawing any conclusions about causality. Further, we do not know what other stressors either concurrent with or following the index critical incident may have contributed to long-term outcomes. It should be emphasised that the outcomes of the current study are self-reported symptoms and not psychiatric diagnoses. Further research could include objective measures of symptom burden, diagnosis and functional impact. Other limitations of this study include self-selection of subjects, which may have introduced a biased sample and a low participation rate. The issues raised in this study require further investigation in research designed to overcome the limitations of a retrospective study.

CONCLUSION

In this cross-sectional study, we found that prolonged duration of five components of the acute stress reaction following a critical incident is associated with increased symptoms of post-traumatic stress and depression, and to a lesser extent, somatisation and burnout. Three of the components studied—disturbed sleep, irritability and social withdrawal—provide potential indicators of later significant symptoms as early as 2 days post-incident. The existence of physical symptoms of acute distress is a potential indicator of later symptoms even before 2 days. These indicators offer the possibility of early self-identification of later psychological difficulties, which is particularly useful for at-risk occupations such as first responders. The findings of this study should be submitted to prospective testing.

Funding Tema Center Memorial Trust, 10480 Islington Ave, Suite 6, Kleinburg, Ontario, Canada L0J 1C0.

Competing interests None.

Ethics approval This study was conducted with the approval of the Sunnybrook Hospital and Mt Sinai Hospital, Toronto, Canada.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

1. **Bennett P**, Williams Y, Page N, *et al*. Associations between organizational and incident factors and emotional distress in emergency ambulance personnel. *Br J Psychol* 2005;**44**:215–26.
2. **Alexander DA**, Klein S. Ambulance personnel and critical incidents: Impact of accident and emergency work on mental health and emotional well-being. *Br J Psychiatry* 2001;**178**:76–81.
3. **Aasa U**, Brulin C, Angquist KA, *et al*. Work-related psychosocial factors, worry about work conditions and health complaints among female and male ambulance personnel. *Scand J Caring Sci* 2005;**19**:251–8.
4. **Halpern J**, Gurevich M, Schwartz B, *et al*. Interventions for critical incident stress in emergency medical services: a qualitative study. *Stress Health* 2009;**25**:139–49.
5. **Brunet A**, Weiss DS, Metzler TJ, *et al*. The Peritraumatic Distress Inventory: a proposed measure of PTSD criterion A2. *Am J Psychiatry* 2001;**58**:1480–5.
6. **Litz BT**, Gray MJ, Bryant RA, *et al*. Early intervention for trauma: current status and future directions. *Clin Psychol Sci Pract* 2002;**9**:112–34.
7. **O'Donnell ML**, Creamer M, Elliott P, *et al*. Tonic and phasic heart rate as predictors of posttraumatic stress disorder. *Psychosom Med* 2007;**69**:256–61.
8. **Koren D**, Arnon I, Lavie P, *et al*. Sleep complaints as early predictors of posttraumatic stress disorder: a 1-year prospective study of injured survivors of motor vehicle accidents. *Am J Psychiatry* 2002;**59**:855–7.
9. **Shalev AY**, Sahar T, Freedman S, *et al*. A prospective study of heart rate response following trauma and the subsequent development of posttraumatic stress disorder. *Arch Gen Psychiatry* 1998;**55**:553–9.
10. **World Health Organization**. International statistical classification of diseases and related health problems tenth revision (ICD-10). 2007. <http://www.who.int/classifications/apps/icd/icd10online> (accessed 14 Jan 2009).
11. **Christodoulou GN**, Paparrigopoulos TJ, Soldatos CR. Acute stress reaction among victims of the 1999 Athens earthquake: help seekers' profile. *World Psychiatry* 2003;**2**:50–3.
12. **Andresen EM**, Malmgren JA, Carter WB, *et al*. Screening for depression in well older adults: evaluation of a short form of the CES-D (Center for Epidemiologic Studies Depression Scale). *Am J Prev Med* 1994;**10**:77–84.
13. **Irwin M**, Artin KH, Oxman MN. Screening for depression in the older adult: criterion validity of the 10-item center for epidemiological studies depression scale (CES-D). *Arch Intern Med* 1999;**159**:1701–4.
14. **Weiss DS**, Marmar CR. The Impact of Event Scale-Revised. In: Wilson J, Keane T, eds. *Assessing psychological trauma and PTSD*. New York: Guilford Press, 1997: 399–411.
15. **Creamer M**, Bell R, Failla S. Psychometric properties of the Impact of Event Scale-Revised. *Behav Res Ther* 2003;**41**:1489–96.
16. **Derogatis LR**. *SCL-90 administration, scoring and procedure manual-I for the R (revised) version*. Baltimore: Johns Hopkins University School of Medicine, 1977.
17. **Derogatis LR**, Spencer PM. The Brief Symptom Inventory (BSI): Administration, Scoring & Procedure Manual-I'. Baltimore: Clinical Psychometric Research, 1982.
18. **Maslach C**, Jackson SE, Leiter MP. Maslach Burnout Inventory. 3rd edn. In: Zalaquett CP, Woods RJ, eds. *Evaluating stress: a book of resources*. Lanham, MD: Scarecrow Education, 1997:191–218.
19. **Hutchon DJR**. Calculator for confidence intervals of odds ratio in an unmatched case control study, 2001. <http://www.hutchon.net/ConfidOR.htm> (accessed 16 Jan 2009).
20. **Newman E**, Davis J. Acute intervention for trauma-related problems. *J Traum Stress* 2008;**21**:501–2.



Identifying risk of emotional sequelae after critical incidents

Janice Halpern, Robert G Maunder, Brian Schwartz, et al.

Emerg Med J 2011 28: 51-56 originally published online May 29, 2010
doi: 10.1136/emj.2009.082982

Updated information and services can be found at:
<http://emj.bmj.com/content/28/1/51.full.html>

These include:

References

This article cites 14 articles, 4 of which can be accessed free at:
<http://emj.bmj.com/content/28/1/51.full.html#ref-list-1>

Article cited in:

<http://emj.bmj.com/content/28/1/51.full.html#related-urls>

Email alerting service

Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Topic Collections

Articles on similar topics can be found in the following collections
[Anxiety disorders \(including OCD and PTSD\)](#) (16 articles)

Notes

To request permissions go to:
<http://group.bmj.com/group/rights-licensing/permissions>

To order reprints go to:
<http://journals.bmj.com/cgi/reprintform>

To subscribe to BMJ go to:
<http://group.bmj.com/subscribe/>