



Research paper

Bringing close others to the emergency department for an acute coronary event is associated with increased patient perception of threat

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ARTICLE INFO

Keywords:

Acute coronary syndrome

Social support

PTSD

Psychological stress

Close relationships

ABSTRACT

Objective: Relationship quality is one of the most consistent psychosocial predictors of physical and mental health. Yet, little research examines relationship types or support within the immediate context of acute health events. We tested the unexplored role that close others play in patients' experience of threat during evaluation for acute coronary syndrome (ACS) in the Emergency Department (ED), as well as the indirect effect of close others on ACS-induced posttraumatic stress disorder (PTSD).

Method: Participants were 871 patients evaluated for ACS at an urban academic ED (60.86 years old; 54.08% male; 56.37% Hispanic, 19.86% Black, 16.65% White). Threat perceptions were assessed in-ED and median 3 days later. ACS-induced PTSD was assessed median 41 days later using the PTSD checklist cued to a specific stressor. Non-overlapping categories were created representing close others in the ED (i.e., spouse/significant other, child), non-close others (e.g., neighbor), or no one.

Results: Patients who brought close others recalled experiencing greater threat in the ED: vs. no one, $b = 0.11$, $p = .072$; vs. non-close others, $b = 0.16$, $p = .030$. There was no direct effect of close others on ACS-induced PTSD; however, recalled threat mediated the effect of close others on development of ACS-induced PTSD, $ps < .05$.

Conclusions: Close others were associated with recalling greater threat during ED evaluation, which predicted ACS-induced PTSD. ACS-induced PTSD is associated with medication nonadherence, event recurrence, and mortality, highlighting the need to develop a greater understanding of the impact stressful medical environments have on patients and close others.

1. Introduction

One of the most consistent psychosocial predictors of physical and mental health is the quality of one's relationships with close others [1–3]. High-quality relationships are associated with biological markers of cardiovascular health [4–6] as well as health behaviors, such as greater medication adherence after acute coronary events (e.g., heart attacks; [7]). Although close others can assist with medication management, exercise, or other behaviors (e.g., by providing reminders, serving as a positive example, etc.), or can simply serve as emotional support, during stressful health-related moments, close others may instead contribute to worse (rather than better) health outcomes for

patients. Furthermore, despite the fact that a diverse range of social relationships have been associated with health outcomes (with more diverse networks associated with better health; [8]), different effects across relationship types remain largely unexplored. We therefore tested the hypothesis that the presence of close others may have adverse consequences (specifically increased threat or stress), particularly when those close others accompany patients to the ED following a stressful health event, and that, ironically, bringing a non-close other to the ED might lead patients to experience better outcomes than bringing a close other.

Acute coronary events, such as acute coronary syndrome (ACS), occur when people experience sudden, reduced blood flow to the heart.

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<https://doi.org/10.1016/j.genhospsych.2018.12.002>

Received 9 August 2018; Received in revised form 27 November 2018; Accepted 4 December 2018

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They are often accompanied by severe chest pain, shortness of breath, lightheadedness, and fatigue. In the United States alone, more than 1,000,000 people a year experience an acute coronary event, with 400,000 people dying from coronary artery disease [9]. The emergency department (ED) is the initial medical environment for most people with acute coronary events [10].

People are often encouraged to have supportive close others in emergency health situations [11] as an ostensible source of support. Critically, the ED deviates from other support environments: it is acutely stressful for patients *and* for others. This is particularly so for close others, such as significant others or children, who may be reliant upon the patient for daily supports, including additional income/financial support, or assistance with housework. The ED differs from other environments in that it is a time of great uncertainty, as patients often arrive in the ED immediately following an acute, life-threatening event (as compared to home environments post-event, or rehabilitation facilities, etc.). Stress in the ED can be due to both situational factors (e.g., overcrowding, exposure to others who are experiencing major health crises, receiving care in hallway areas with little to no privacy) and psychological factors (e.g., extreme uncertainty and fear regarding one's health, concerns regarding impact on family members or living situation; [10,12]).

For close others, witnessing a patient in pain and under duress is stressful [13], and, as such, close others often need emotional support themselves. However, patients may not feel capable of providing support to their close others while undergoing stressful health events [14,15]. Indeed, patients report greater posttraumatic stress disorder (PTSD) symptoms in the days following an acute coronary event when accompanied by people who require their support [14]. Furthermore, evidence suggests that, when an individual who is providing support undergoes an anxiety induction, the person who receives that support also experiences heightened cardiovascular reactivity (e.g., higher systolic and diastolic blood pressure; [16]). In other words, close others who are distressed may paradoxically provoke distress in those they try to support. Lastly, the presence of a close other during an acute, life-threatening event could make salient patients' concerns about what would happen to their family members if they were to die—a common worry during and after ACS events. In other words, the way patients think about the meaning of the ACS may be affected. Thus, there are several reasons to expect that the presence of close others can lead patients to experience increased threat—feeling fearful, helpless, and out of control (“threat perceptions”)—in the ED.

An additional goal of the present research was to examine how stress in the ED affects PTSD symptoms as a result of the trauma of the ACS (i.e., ACS-induced PTSD) more than one month later. Research has begun to unpack the heterogeneity of reactions to potentially traumatic events, including life-threatening medical events [17,18]. Although resilience emerges as the modal response to such events [19], among patients with suspected ACS, roughly one in eight go on to develop clinically significant posttraumatic stress symptoms [20]. The subjective experience of an ACS incident as a significant threat (e.g., marked feelings of helplessness) has been firmly established as a risk factor of ACS-induced PTSD in prior work [20–22]. ACS-induced PTSD has been consistently linked to poor quality of life [23], as well as excess risk for secondary cardiovascular events and mortality, likely due to the association of ACS-induced PTSD with nonadherence to cardiovascular medications [20,24], systemic inflammation [25], autonomic imbalance [26], avoidance of physical activity [27], and poor sleep [28]. As such, it is critical to understand contributors to the development of ACS-induced PTSD.

2. Current research

The present research addressed two questions. First, compared to the presence of a non-close other in the ED or to arriving in the ED with no one, does the presence of a close other in the ED lead ACS patients to

experience greater feelings of threat (a) during ED evaluation and (b) shortly after the event? Second, does the presence of close others in the ED indirectly increase risk for developing ACS-induced PTSD, inasmuch as it increases patients' threat perceptions (i.e., feelings of fear, helplessness, and a lack of control)?

We hypothesized that the presence of close others would be associated with greater patient self-reported threat perceptions than the presence of a non-close other or no one, and thereby increase risk for ACS-induced PTSD more than one month post-discharge. In other words, there would be an indirect effect of close vs. non-close other/no one on PTSD, as “mediated” through threat perceptions. In a large-scale study of 871 patients, we compared self-reported threat perceptions in-ED and at recall in patients who were accompanied by a close other during ED evaluation for ACS at a large, urban hospital to (a) those who were accompanied by a non-close other (e.g., a neighbor) and (b) those who were accompanied by no one. Next, we tested the indirect effect of bringing a close other (vs. a non-close other or no one) on ACS-induced PTSD, mediated through threat perceptions both (a) in ED and (b) recalled several days later at follow-up. We also explored the potential direct effect of the presence of close others on subsequent ACS-induced PTSD. Although we reasoned that there could be a significant effect whereby close others predicted greater likelihood of ACS-induced PTSD, given that this is a distal effect (assessed at least one month later, during which patients likely have countless and varied interactions with their close others), we did not necessarily expect this to be significant. It instead seemed more reasonable to test the hypothesis that close others would have a direct effect on a more proximal process that captures the psychological experience of stress—threat perceptions closer in time to the ACS event, as in Homma et al. [14].

A secondary goal of the present research was to measure patients' threat perceptions of the ED experience at two time points: during ED evaluation for ACS and after participants had been admitted to the inpatient unit or discharged from the hospital. Patients who are admitted to the ED for suspected ACS spend an average of 12 h in the ED for ACS evaluation and, if they are admitted to the inpatient unit, waiting for a bed to become available (i.e., “ED boarding”; [10,29]). Because we initially assessed threat perceptions during the ED stay, patients often spend many more hours in the ED prior to inpatient transfer or discharge from the ED. Therefore, patients' recalled threat perceptions at the second assessment may better capture the entirety of their ED experience. Alternatively, cognitive processing of stressful events in the first days after an event could lead patients either to exacerbate or minimize their in-ED threat perceptions when recalling their experience days later. In the present study, we examined the potentially unique effects of in-ED threat perceptions and recall of threat perceptions on ACS-induced PTSD.

3. Methods

3.1. Participants

Participants were 871 patients with complete data who were enrolled in a larger observational cohort study (REactions to Acute Care and Hospitalization [REACH]) of patients who presented to the Columbia-New York Presbyterian Hospital ED for evaluation for suspected ACS (i.e., non-ST elevation myocardial infarction [NSTEMI] or unstable angina [UA]). The REACH study aims to examine ED factors (e.g., crowding) contributing to risk for ACS-induced PTSD and related cardiovascular outcomes. The study was approved by the Institutional Review Board of Columbia University, and all participants gave informed consent before completing study procedures. Because study recruitment was conducted in the ED during a particularly sensitive time, additional considerations were made while obtaining informed consent from participants. First, permission was obtained from attending physicians prior to approaching potential participants. Physicians informed research coordinators as to the emotional state and

comfort level of each potential participant; participants experiencing any emotional or physical distress were reminded of the voluntary nature of the study and/or approached at a later time. We recruited the largest sample size possible given financial feasibility and the number of individuals who presented in the ED for evaluation for ACS at the time of the study.

3.2. Procedure

Participants gave informed consent, reported demographic information, and reported on their current threat perceptions during ED evaluation and treatment. Medical information (i.e., Global Registry of Acute Coronary Events [GRACE] risk scores and Charlson comorbidity index) and discharge diagnosis (confirmed ACS) were extracted from chart review. Participants were transferred from the ED after a mean of 14.92 h ($SD = 7.98$ h) of ED stay, either to home ($n = 181$) or to an inpatient bed ($n = 690$). A follow-up interview was conducted within 0 to 61 days of this transfer ($M = 6.20$ days, $SD = 7.80$ days, median = 3 days; 80% occurred within 10 days). Some completed this assessment at home ($n = 467$) and some in an inpatient bed ($n = 404$; 1 began the assessment in-hospital but finished it at home). Participants reported again on ED threat perceptions, recalled who was present in the ED, and reported symptoms of pre-existing PTSD and depression. More than one month post-discharge ($M = 51.92$ days, $SD = 27.82$ days, median = 41 days), participants reported PTSD symptoms specific to the cardiac event (i.e., ACS-induced PTSD) via telephone interview (see Fig. 1 for a timeline).

3.3. Measures

All measures were translated into Spanish and back-translated by certified translators. A timeline of measures is depicted in Fig. 2.

3.3.1. Close others

Participants reported (yes/no) on who was present with them in the ED using the question: “Were any of the following people with you in the emergency room?” Options included spouse/partner, child, other relative, neighbors/friends, church/other community member, and home attendant/visiting nurse. We created three categories: bringing a close other to the ED (i.e., spouse/partner or child), bringing a non-close other to the ED (i.e., other relative, neighbors/friends, church/other community member, or home attendant/visiting nurse), or bringing no one. If a spouse/partner or child was present, this was considered as having a close other present. (It was possible that non-close others may also have been present, yet close others were considered to supersede this category; only 6.43% of participants arrived with close and non-close others. It is also possible that both a spouse/partner and child were present; this was considered to fall in the “close other” category.)

From these categories, two dummy codes were created to test the association of the presence of close others (vs. being alone or with non-close others) with threat perceptions and ACS-induced PTSD. One dummy code tested the effect of bringing a close other vs. being alone (close other coded as 1, being alone coded as 0, non-close other coded

as 1). The other dummy code tested the effect of bringing a close other vs. bringing a non-close other (close other coded as 1, being alone coded as 1, non-close other coded as 0).

3.3.2. ED threat perceptions

Threat perceptions in response to evaluation for suspected ACS in the ED were assessed twice—at ED evaluation and recall—using the seven-item ED Threat Perceptions questionnaire, which has been validated in both English- and Spanish-speaking patients [30]. The scale was developed based on prior research on peri-traumatic predictors of PTSD [31], and has been validated in both English- and Spanish-speaking patients. Participants rated the extent to which statements (e.g., “I am afraid,” “I feel helpless”) reflected their ED experiences on 4-point Likert scales ranging from 1 (*not at all*) to 4 (*extremely*). At the recall assessments, items were worded in the past tense (e.g., “I was afraid”). The mean of the seven items served as the summary score for analysis ($\alpha = 0.81$ and 0.83 at ED evaluation and bedside recall, respectively; these numbers were 0.81 and 0.84 for English-speaking patients, and 0.82 and 0.82 for Spanish-speaking patients). Scale items are available in the Supplemental Online Material (SOM).

3.3.3. ACS-induced PTSD

Likely ACS-induced PTSD (i.e., PTSD with respect to the “heart problem, ED visit, and hospitalization”) was measured using the PTSD Checklist cued to a specific stressor (PCL-S; [32]), a valid tool to assess PTSD symptoms secondary to acute cardiovascular events [33]. Assessment occurred one month following the ACS, per requirements for PTSD diagnosis. Partway through the study, the DSM-5 and corresponding PCL-5 [34] were released, and so the study assessment was changed from the PCL-S to the PCL-5 in order to reflect updated criteria. Items were matched across these two instruments to create a 17-item summary score of PTSD symptomology experienced within the past month (see the SOM for a comparison of the two scales). Items are rated on a 5-point Likert scale scored from 1 (*not at all*) to 5 (*extremely*), and total symptom severity is obtained by summing all items. This total was dichotomized, with scores ≥ 33 indicating a positive screen for PTSD (note that a positive PTSD screen did not require fear, horror, or hopelessness during the ACS event; [35]). This cutoff was chosen because it was used previously in a recent meta-analysis examining the association between PTSD and cardiovascular risk [20] and because it is in the middle of the range of cutoffs (30–35) suggested by the National Center for PTSD [36].

3.3.4. Demographics

Age, partner status, race/ethnicity, and gender were included as covariates. Age has previously been associated with increased risk for ACS-induced PTSD [21], but may also be associated with who accompanies a patient to the ED (e.g., older patients may be widowed). Similar reasoning was applied when deciding to include partner status as a covariate. Gender and race/ethnicity have also been associated with PTSD (e.g., higher rates of PTSD in trauma-exposed Black individuals vs. White individuals; [37,38]).

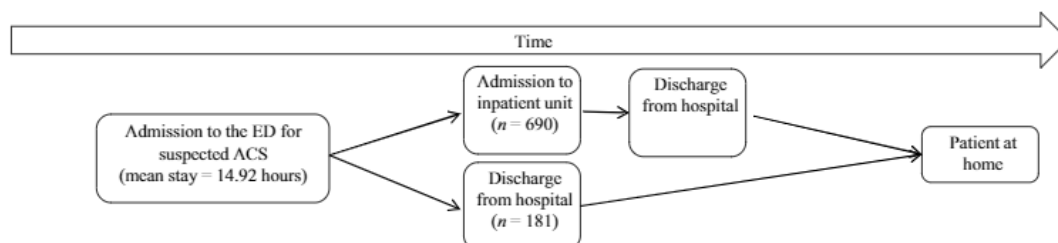


Fig. 1. Study flow for $N = 871$ participants.

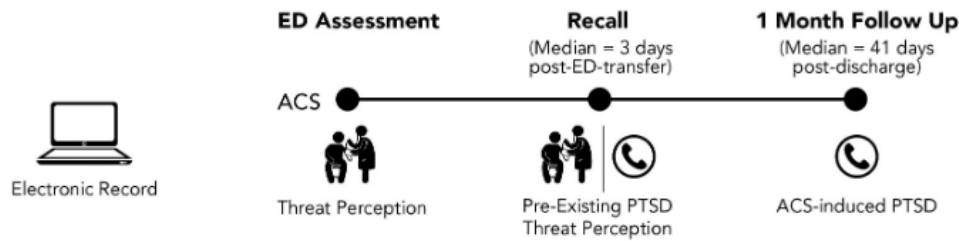


Fig. 2. Timeline for study assessments.

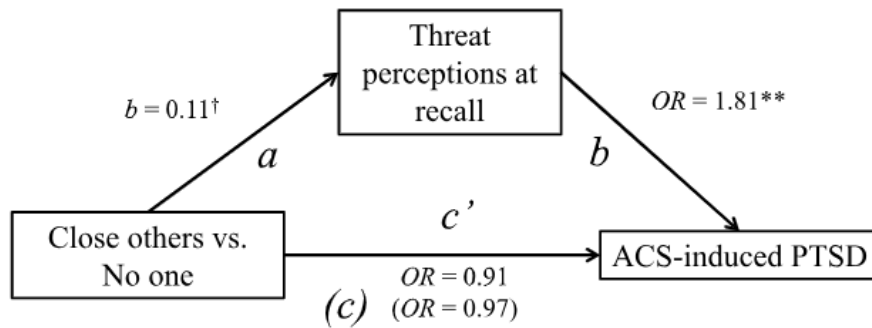


Fig. 3. Mediation model showing the indirect effect of bringing close others to the ED vs. bringing no one to the ED on probable ACS-induced PTSD more than one month later through ED threat perceptions at recall. $^\dagger p < .05$, $^{**} p < .01$.

3.3.5. Pre-existing mental health status

Pre-existing PTSD was measured at baseline as a control variable using the PTSD Checklist-Civilian version (PCL-C; [32]). This scale assesses self-reported PTSD symptoms in the past month due to a previous trauma and not the current ACS event. The PCL-C was keyed to a pre-existing trauma determined based upon the participant's response to the Life Events Checklist (LEC). Participants were prompted to identify the “most stressful” event reported on the LEC which still presently caused them distress. Answers to the PCL-C were then reported in response to that index event. The PCL-C consists of 17 items corresponding to DSM-IV criteria assessed on a 5-point scale ranging from 1 (*not at all*) to 5 (*extremely*). A continuous measure of symptom severity can be obtained by summing scores across the 17 items and dichotomized at ≥ 33 to indicate symptom elevation and a positive PTSD screen. It is important to adjust for pre-existing PTSD when examining the effects of threat perceptions on ACS-induced PTSD to ensure associations are specific to PTSD developed after the ACS event [12].

Pre-existing depression was measured at baseline using the eight-item Patient Health Questionnaire (PHQ-8; [39]; e.g., “Feeling down, depressed, or hopeless”) on a 4-point Likert scaled scored from 0 (*not at all*) to 3 (*nearly every day*). Items were summed to create a total score and dichotomized, with scores ≥ 10 indicating clinically significant depression [39]. It is important to adjust for depression as a potential confound because depression is associated with both increased perceptions of stress in the ED and development of ACS-induced PTSD [12,40], and because depression exhibits bidirectional associations with relationship quality ([2]; i.e., depressed patients may be less likely to be accompanied and more likely to experience threat and develop PTSD).

3.3.6. Medical status

Patients with a worse health status may be more likely to have caregivers and may have different perceptions of threat due to medical events because of ongoing medical concerns [41]. The objective nature of the event (i.e., how severe it was, true likelihood of death/disability) may also influence results. Thus, we controlled for confirmed ACS status, GRACE risk scores, and comorbidity.

Confirmed ACS was included as a covariate. Although all participants had an admitting diagnosis of NSTEMI or UA, not all were discharged with a diagnosis of ACS (i.e., some patients ruled out for ACS prior to discharge). We chose to include this as a covariate rather than to exclude non-ACS for two primary reasons. First, we have found that patients are

often inaccurate when reporting whether or not they had (or did not have) a confirmed ACS. Second, true ACS patients and those who rule out for ACS do not differ in risk for developing subsequent PTSD [42].

GRACE risk scores are calculated using a validated prediction model of six-month mortality risk for cardiovascular patients post-discharge [43]. For example, age, blood pressure, and history of myocardial infarction (extracted via chart review) are included in this index. Possible scores range from 1 to 163, with higher scores indicating greater risk.

Charlson comorbidity index reflects likelihood of one-year mortality [44], such that higher scores (range: 0, 37) indicate more severe comorbidity (i.e., the presence of more, comorbid medical conditions). The Charlson comorbidity is calculated by weighting and summing the presence of 19 conditions such as diabetes mellitus and congestive heart failure. Conditions were extracted via chart review.

3.4. Data analysis strategy

Regression analyses were conducted to examine the association between the presence of close others in the ED with threat perceptions during ED evaluation for suspected ACS and at recall. Logistic regression was used to examine likelihood of probable ACS-induced PTSD (symptom score ≥ 33) from ED threat perceptions; sensitivity analysis explored ACS-induced PTSD as a continuous outcome. We examined the indirect effect of close others on ACS-induced PTSD through threat perceptions using 1001 bootstrapped samples (see Figs. 3 and 4; [45]). To test significance, we conducted the analysis in each of these samples and examined the percentage of the time that both path *a* and path *b* were positive (i.e., in the hypothesized direction) and computed the *p*-value as one minus this percentage.

Several covariates were included in the models, given their potential as confounds and/or previous research indicating their association with PTSD. These were selected a priori.¹ All analyses controlled for gender, age (scaled to represent decades), race/ethnicity, and psychological and medical factors that could contribute to the development of ACS-induced PTSD: probable PTSD at baseline (score ≥ 33), baseline

¹ Socioeconomic status and English as a first language were not pre-selected covariates, so they were not included in the model. Additional models with these covariates added did not alter the significance or the direction of the reported results.

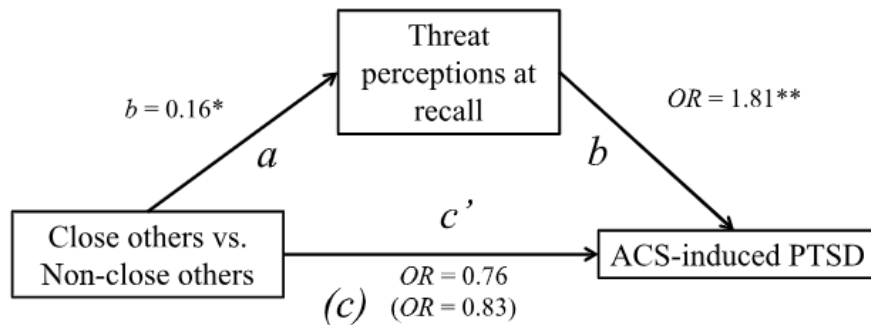


Fig. 4. Mediation model showing the indirect effect of bringing close others to the ED vs. bringing non-close others to the ED on probable ACS-induced PTSD more than one month later through ED threat perceptions at recall. * $p < .05$, ** $p < .01$.

depression (score ≥ 10), confirmed ACS, Charlson comorbidity index, and GRACE score. Finally, we controlled for partner status (partner/spouse vs. no partner/spouse). At the outset of the study, we a priori determined the core demographic and clinical covariates for models predicting PTSD, including pre-existing PTSD (due to prior, non-medical trauma) and depression. For consistency, the same covariates were included in all models.

We note that in our primary analyses, demographics did not predict threat perceptions or ACS-induced PTSD, but, as they were chosen a priori and for consistency in the literature, we included them. We included these covariates to isolate the effect of the presence of close others on PTSD. Nevertheless, we present the results without covariates in Tables S1 and S2 in the SOM for interested readers.

4. Results

Participants were 60.86 ($SD = 13.00$) years old, 396 reported having a partner/spouse (45.46%), and 471 were male (54.08%). Participants were mostly Hispanic (491, 56.37%), 173 were Black (19.86%), 145 were White (16.65%), and 62 reported “Other” (7.12%). Half of the participants spoke English as a first language (438, 50.29%) and half spoke Spanish as a first language (433, 49.71%). Participants who spoke Spanish as a first language completed the study in Spanish. The sample demographics were reflective of the catchment area (i.e., community) served by New York Presbyterian Hospital. About half of the sample had completed no more than high school: 157 (18.03%) had not attended high school at all, 142 (16.30%) completed some high school, and 190 (21.81%) earned a high school diploma or a GED. A total of 22 (2.53%) participants had completed trade or vocational school, 124 (14.24%) completed some college, 136 (15.61%) had a college degree, and 100 (11.48%) had a graduate or professional degree. Approximately 20% had a positive screen for PTSD due to a prior (non-ACS) event (158, 18.14%); more participants had a positive depression screen above the clinical cutoff (233, 26.75%). Participants were more often with close others or alone than with non-close others (347, 39.84%; 372, 42.71%; and 152, 17.45%, respectively).

We examined whether data at recall were missing at random. Participants were more likely to be lost to follow up ($n = 129$) if they (1) arrived in the ED with non-close others, $\chi^2(2) = 35.62$, $p < .001$, (2) had no pre-existing PTSD, $\chi^2(1) = 18.72$, $p < .001$, and (3) were discharged with a diagnosis other than confirmed ACS, $\chi^2(1) = 10.53$, $p = .001$. No other variables were related to inclusion in the final sample. Results are reported in the main text. Information for all coefficients, including covariates, is available in Tables S3 and S4 in the SOM. Data and syntax for all analyses are located at <https://tinyurl.com/y8c58n2t>.

4.1. Threat perceptions

4.1.1. Preliminary analyses

Threat perceptions did not differ between participants who were discharged home vs. those admitted to inpatient beds or assessed at home vs. inpatient (for recall assessment). However, time between ED and recall assessments differed between patients who completed ratings at home (10.3 days) vs. inpatient (2.3), $p < .01$. Time from ED to recall assessment did not differ between participants accompanied by close others vs. non-close others or no one. For details, see SOM.

4.1.2. Primary analyses

We examined the hypothesis that being accompanied by a close other in the ED would be associated with greater threat perceptions at ED assessment and recall, relative to bringing no one and to bringing a non-close other. Being accompanied by a close other compared to being alone in the ED was not associated with threat perceptions at ED assessment, $b = -0.03$, $SE = 0.06$; 95% CI: $-0.14, 0.08$, $t(857) = 0.58$, $p = .56$; being accompanied by a close other (vs. non-close other) was also not associated with threat perceptions at ED assessment, $b = 0.08$, $SE = 0.07$; 95% CI: $-0.06, 0.21$, $t(857) = 1.06$, $p = .29$. However, there was a trend for participants accompanied by close others in the ED to recall greater threat perceptions at follow up compared to participants who were alone in the ED, $b = 0.11$, $SE = 0.06$; 95% CI: $-0.01, 0.22$, $t(857) = 1.80$, $p = .072$ (partial $\eta^2 = 0.004$; path a in Fig. 3); participants accompanied by close others recalled significantly greater threat perceptions as compared to those accompanied by non-close others, $b = 0.16$, $SE = 0.08$; 95% CI: $0.02, 0.31$, $t(857) = 2.18$, $p = .030$ (though the effect size was small, partial $\eta^2 = 0.01$; path a in Fig. 4).

Participants accompanied by a non-close other did not differ from participants who were alone in the ED on threat perceptions at recall, $b = -0.06$, $SE = 0.07$; 95% CI: $-0.20, 0.08$, $t(857) = 0.82$, $p = .41$.

4.2. ACS-induced PTSD

We next tested whether greater threat perceptions at recall predicted ACS-induced PTSD. Each unit increase in mean threat perceptions (e.g., from “not at all” to “a little bit”) at recall was associated with a 79% increased odds of a positive screen for ACS-induced PTSD, $OR = 1.79$, 95% CI: 1.31, 2.45, Wald $\chi^2 = 13.54$, $p < .001$ (controlling for the presence of others in the ED: $OR = 1.81$, 95% CI: 1.32, 2.47, Wald $\chi^2 = 13.82$, $p < .001$; path b in Figs. 3 and 4). The direct effect of close others in the ED vs. bringing no one to the ED on ACS-induced PTSD was not significant, $OR = 0.97$, 95% CI: 0.56, 1.72, Wald $\chi^2 = 0.011$, $p = .92$ (path c in Fig. 4). The direct effect of close others in the ED vs. non-close others on ACS-induced PTSD was not significant, $OR = 0.83$, 95% CI: 0.42, 1.66, Wald $\chi^2 = 0.28$, $p = .60$ (path c in Fig. 4). These c paths remained nonsignificant when ACS-induced PTSD was entered as a continuous outcome in sensitivity analyses, $ps = .19$

and .52, respectively; threat perceptions at recall remained associated with ACS-induced PTSD, $B = 3.04$, 95% CI: 1.91, 4.18, $p < .001$. Because a direct effect is not a prerequisite for a significant or meaningful indirect effect [46], we proceeded with mediation analyses.

To determine whether the increased threat perceptions reported at recall for participants who had been accompanied by close others in the ED resulted in a significant indirect effect on subsequent ACS-induced PTSD, we conducted a mediation analysis using 1001 bootstrapped samples [45]. The indirect effect of being accompanied by a close other in the ED on risk for ACS-induced PTSD, through increased threat perceptions at recall, was positive and significant: vs. alone, $p = .036$; vs. non-close others, $p = .017$ ($p = .036$ and $p < .001$ in sensitivity analyses with continuous PTSD scores).

5. Discussion

In a large sample of patients evaluated for ACS, we found that patients who were accompanied by a close other in the ED (i.e., a spouse/partner or child) recalled perceiving greater threat during ED evaluation than those accompanied by no one or by a non-close other (e.g., a neighbor). Furthermore, those who recalled greater threat perceptions were more likely to screen positive for ACS-induced PTSD more than one month later, yielding a small but significant indirect effect of having a close other in the ED on increased risk for development of ACS-induced PTSD. This is the first research to test whether the presence of a close other during an acutely life-threatening health event shapes patients' perceptions of—and subsequent psychological adjustment to—that event.

At first glance, these results appear at odds with research demonstrating the benefits of close others for physical and mental health [1–3]. However, most prior work has examined social support and health within a general context, or has focused on what happens *after* acutely stressful health events when patients and support providers are managing ongoing care in their daily environments [47,48]. In contrast, being in an ED and experiencing the acute phase of ACS evaluation and treatment can be distressing for both patients and their close others [10,12,49]. It is also important to note that, although the indirect effect was significant, there was no direct effect of close others on the development of ACS-induced PTSD. This lack of an effect suggests that there may be other, positive effects of the presence of close others in the ED that offset any additional risk caused by heightened threat perceptions. Research examining the reasons people bring close others to the ED is also critical. In particular, populations who may not have access to close others (e.g., immigrants who arrive without family) may be restricted in their choice of who they can bring with them to the ED—although a similar percentage of those who spoke English as their first language arrived in the ED with close others as those who did not speak English as their first language (40.64% and 39.03%, respectively), 48.59% of White participants brought close others, but only 38.29% of Hispanic participants brought close others.

Although this study did not test mechanisms of the effect, prior research suggests that patients may feel more threatened because close others need the patient to comfort them during the ED stay [14]. Patients likely recognize that need, but may feel unable to meet it, leading to heightened awareness of the impact of the event on their family. Indeed, although the effect sizes were small, patients were less threatened when accompanied by a friend or neighbor (rather than a close family relative) for the many hours of ED evaluation and treatment for an acute cardiovascular event. Even being treated in the ED alone appears less threatening than spending those hours with a spouse or child. More research is needed to identify the specific behaviors or interactions between close others and patients that contribute to elevations in threat perceptions. Such work could inform efforts to help close others provide more appropriate (i.e., less stressful) comfort and care to instead maximize the potential benefits of close others in the ED (though not assessed within the present study). Similarly, future work should simultaneously consider positive effects of close others on patients' ED experience, such as serving as an advocate, providing additional

information to the care team, or remembering discharge instructions, in order to gain a better understanding of the net effect close others have on patients, both in the ED and over time.

Although we found that being accompanied by a close other in the ED was associated with greater threat when recalling the ED experience a median of three days post-transfer from the ED, the presence of a close other (vs. no one or a non-close other) was not related to perceptions of threat assessed during the ED stay. One reason for the discrepancy may be that participants' recall ratings reflect the threat they experienced throughout their entire ED stay (the first assessment may have occurred at any time during the ED stay), and it is possible that the stress of having a close other in the ED accumulates over time spent in the ED. Patients may also have received additional information from the ED care team that could change their appraisal of the impact and threat of the ACS, as well as that of their close others. For example, uncertainty may play a larger role in threat perceptions in-ED, but later threat perceptions may reflect a more concrete understanding of the ramifications of the event. The recall assessment may additionally capture patients' post-ED rumination about stressful aspects of the ED experience, particularly with respect to their familial obligations. For example, patients may ruminate (or patients and partners may co-ruminate) about what will happen to those reliant upon them if they cannot maintain previous responsibilities [49]. Or, perhaps close others who are concerned about behavior change (e.g., those who pressure patients to take medications or to attend cardiac rehabilitation) continue to emphasize the threat of the event in hopes that it will motivate patient compliance to treatment recommendations. Finally, it is possible that co-construction of memory accounts for the excess threat reported at recall. When two people (particularly those in close relationships) discuss shared experiences, each can incorporate the experience of the other into their own memories (e.g., shared emotions, details of the event; [50,51]). If close others discuss the stressful experience of the ED with patients, this could (a) implant additional, threatening memories in patients or (b) shape memories so as to make the ED seem even more threatening than initially experienced. The fact that mean threat perceptions were greater at recall than at ED assessment provides some initial support for this explanation.

Results should also be considered in light of recent changes to PTSD diagnostic criteria in DSM-5. Specifically, Criterion A2 (the response of subjective fear, helplessness, or horror following the traumatic event) was removed because it conflated the trauma exposure with the response and added little predictive value—largely because it excluded individuals who met all other criteria for PTSD but retrospectively reported no immediate intense fear, helplessness, or horror at the time of the event [35,52,53]. However, prior findings suggesting relatively low added predictive value of a self-reported, retrospective, binary criterion for PTSD diagnostic accuracy, based on cross-sectional epidemiological studies, do not mean that between-person differences in fear of death, vulnerability, and lack of control do not contribute to the prospective prediction of PTSD symptoms. Indeed, in the present study, those early threat responses were robustly predictive of ACS-induced PTSD symptom severity one month later. Of course, the argument concerning whether acute medical events should be considered Criterion A1 traumatic events according to DSM-5 has not been settled. Yet, it is apparent that patients experiencing acute, life-threatening events screen positive for PTSD, and also exhibit increased risk for adverse future consequences (e.g., physiological dysregulation, event recurrence and mortality, poor health behaviors) [20,22,24,54,55]. We have argued that ACS-induced PTSD differs from PTSD as traditionally conceptualized in a number of critical ways [56], and that the phenomenon is important to study whether or not we call it PTSD.

5.1. Limitations

There are important limitations to discuss for the present work. PTSD was assessed using the gold standard screening tool, not clinical diagnosis. We were, however, primarily interested in assessing the

extent of PTSD symptoms rather than determining a true clinical diagnosis for PTSD. Although we controlled for previous depression and PTSD prior to the ACS event, we were unable to control for preexisting anxiety disorders, which may confound the relationship between having close others present and threat perceptions. Prior PTSD may have also been influenced by distress because it was assessed via self-report in-hospital.

Another issue has to do with the creation of a “close others” category and with subjective measures of closeness. We created the category of “close others” based on assumed interdependence, reasoning that daily supports and responsibilities were most likely to be shared between patients and their significant other or child(ren). The true degree of interdependence (e.g., financial or caregiving responsibilities) between patients and close or non-close others, however, could moderate the effect of close others on threat perceptions. Relationship quality is another important consideration for future research, as we imagine that those in higher quality relationships may be more inclined to go with their close others to the ED. This could mask significant effects if people with high quality relationships experience benefits and those in lower quality relationships are at particular risk for experiencing elevated threat. Future work should also consider patient-reported categorization of who a “close other” or “non-close other” is, and should tease apart conceptual distinctions between interdependent functioning and emotional closeness.

We were not able to assess threat experienced by close or non-close others during and after the ED experience, but future research should examine how others feel during these experiences and how their experiences of threat and support shape important psychological outcomes both for patients and for themselves. Future research should also critically examine the times at which the close other was present and how differences in timelines might affect dynamic processes between patients and partners (e.g., was the close other present during symptom onset? For the duration of the ED stay? etc.). For example, it is possible that close others were more likely to be present during symptom onset than non-close others, and were therefore more anxious, or that those close others who were there for the duration of onset and ED care felt less uncertain due to increased contact with the patient and care team. We are not able to examine this with the present data. Finally, it is possible that people who felt more threatened when experiencing symptoms may have been more likely to insist that a family member be present. Were this the case, it could erroneously appear that close others contribute to increased threat perceptions, when in actuality threat perceptions lead people to bring close others to the ED. However, the fact that there was no effect of close others on threat perceptions at ED assessment, the assessment that was more immediate to the ACS event and, therefore, would be the most likely to reflect this potential reverse causation, provides some confidence that this is not necessarily the case.² Rather, the association between close others and increased threat perceptions at recall suggests that this is due to a dynamic that unfolds during or immediately following the ED experience between patients and close others.

6. Conclusion

More than 1,000,000 people experience an acute coronary event each year, and most of these patients arrive in the ED [9,10] where they

² We also tested to see whether participants with pre-existing depression or PTSD were more likely to arrive in the ED with close others. Although pre-existing depression and PTSD were indeed associated with companion type, results indicated that these participants were actually less likely to arrive with close others: Depression, $\chi^2(2) = 8.89, p = .012$; those with pre-existing depression were significantly less likely to arrive with close others (32.62% depressed v. 42.48% non-depressed), and a follow-up z-test to compare proportions [57] indicated that this difference was significant. For pre-existing PTSD, $\chi^2(2) = 4.99, p = .083$; those with pre-existing PTSD were also less likely to arrive with close others (34.81% with PTSD v. 40.95% without), although this difference was not significant.

are often encouraged to have close others present to provide support [11]. Although close others may serve numerous positive functions for patients during their ED stay, our results suggest that the presence of a close other in the acutely stressful context of the ED can exacerbate patients' recall of threat during ED evaluation for ACS, and that this can indirectly contribute to the subsequent development of ACS-induced PTSD. A better understanding of both positive and negative consequences of support partners in the ED is needed to inform best hospital practice and to develop interventions to support patients and their close others.

Acknowledgements

This work was supported by National Heart, Lung, and Blood Institute (NHLBI) grants to Dr. Edmondson [grant numbers R01HL117832, R01HL128310] and Dr. Kronish [R01HL123368]. Dr. Chang is supported by a mentored career development grant by the National Institute of Health/NCAT [KL2 TRANSFORM: KL2TR0001874] and the NY Empire Clinical Research Investigator Program. All authors report no conflicts of interest.

Supplementary Online Material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.genhosppsych.2018.12.002>.

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