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ORIGINAL CONTRIBUTION

Mental health conditions in older multimorbid patients presenting to the emergency department for acute cardiac symptoms: Cross-sectional findings from the EMASPOT study

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Abstract

Background: This study aimed to (1) examine the proportion of patients presenting to an emergency department (ED) for acute cardiac symptoms with comorbid mental health conditions (MHCs) comprising current depression, generalized anxiety disorder, and panic disorder; (2) compare cardiac patients with and without MHCs regarding sociodemographic, medical, and psychological characteristics; and (3) examine recognition and treatment rates of MHCs.

Methods: Multimorbid patients, aged ≥50 years, presenting to an inner-city ED with acute cardiac symptoms including chest pain, dyspnea, and palpitations, completed validated self-report instruments assessing MHCs and a questionnaire collecting psychosocial and medical information. In addition, routine medical data were extracted from the electronic health record.

Results: A total of 641 patients were included in the study. Mean (±SD) age was 68.8 (±10.8) years and 41.7% were female. Based on screening instruments, 28.4% of patients were affected with comorbid MHCs. Patients reported clinically significant symptoms of depression (23.3% PHQ-9 ≥10), generalized anxiety disorder (12.2% GAD-7 ≥10), and panic disorder (4.7% PHQ-PD). Patients with MHCs were more likely to be younger, female, lower educated, and unemployed. The presence of MHCs was associated with higher cardiac symptom burden and subjective treatment urgency as well as more psychosocial distress (PHQ-stress) and impaired quality of life (SF-12v2). Of all patients, 15.6% were identified with new or unrecognized MHCs.

Conclusions: MHCs are prevalent in nearly one-third of patients presenting with cardinal cardiac symptoms. Thus, the ED visit offers an opportunity to identify and refer patients with MHCs to appropriate and timely care after exclusion of life-threatening conditions.

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KEYWORDS
acute coronary syndrome, anxiety disorder, chest pain, depression, emergency department, mental health condition

INTRODUCTION

Background

Multimorbidity, commonly defined as the presence of two or more chronic diseases,[1] poses great challenges to emergency and acute care due to its complexity.[2,3] Previous research has shown that somatic multimorbidity is strongly associated with increased use of emergency departments (EDs),[4,5] and risk of ED admission is exacerbated by the additional coexistence of mental health conditions (MHCs).[6–8] However, separating physical and mental health problems is particularly common in the ED, where resources are scarce and comorbid MHCs often go unnoticed and, in consequence, untreated,[9–11] especially in older multimorbid patients.[12,13]

In particular, the relation between cardiovascular disease (CVD) and MHCs such as depression[14] as well as anxiety disorders like generalized anxiety disorder[15] and panic disorder[16] has been well studied. Generalized anxiety disorder is a long-term condition that causes anxiety and worry about a wide range of situations and issues, accompanied by such somatic symptoms as restlessness, fatigue, palpitations, dry mouth, and sweating,[17] which are also common in patients with CVD, especially heart failure.[18] Panic disorder refers to an acute anxiety condition of recurrent, unexpected panic attacks—an abrupt surge of intense fear in which somatic symptoms such as palpitations, shortness of breath, dizziness, nausea, and chest pain occur,[19] which could potentially be experienced in the setting of arrhythmia or acute coronary syndrome (ACS).[18] Depression is characterized by a negative affective state, ranging from unhappiness and discontent to extreme feelings of sadness, pessimism, and despondency, often accompanied by bodily weakness, fatigue, and debility.[19] Depression has been linked to poor adherence to medical treatment especially in patients with heart failure,[20,21] thus contributing to ED visits attributable to acute cardiac events related to medication nonadherence.[22,23] However, studies have confirmed that identification of these MHCs in patients with CVD is limited.[10,24] Diagnostic challenges due to substantial overlap between cardiac and psychiatric symptoms may play a role just as much as the co-occurrence of cardiac and mental affections.

Still, most previous research investigating MHCs in the ED has focused on younger and less morbid patient cohorts who present primarily for a diagnosis of depression,[25–28] generalized anxiety disorder,[25,28,29] or panic disorder with a chief complaint of chest pain.[30–32] Thus, little is known about the prevalence of these MHCs as comorbidities in older (≥50 years of age) patients with more than one chronic somatic disease seeking urgent care in the ED for a variety of acute cardiac symptoms. This is of importance because multimorbid patients not only have an elevated risk to develop MHCs, but they may also seek ED care for somatic conditions that are exacerbated by having comorbid MHCs.

Objectives

To provide a comprehensive evaluation and address the problem of unnoticed comorbid MHCs in an aging population, we aimed to investigate a representative sample of older multimorbid patients in a real-life routine ED setting. The objectives of this study were to examine the proportion of patients presenting to an ED for acute cardiac symptoms with comorbid clinically significant symptoms of depression, generalized anxiety disorder, and panic disorder; to characterize cardiac patients with and without these MHCs; and to examine depression and anxiety recognition during the ED visit. In addition, we assessed rates of mental health treatment (i.e., psychopharmacotherapy, psychotherapy, and counseling).

METHODS

Study design

The EMASPOT study is a prospective multicenter cohort study. Eight hospital-based EDs located in the city center of Berlin, Germany, participated in the study. All included EDs are members of the Emergency and Acute Medicine Network for Health Care Research (EMANet, https://emanet.charite.de/en/).[33]

Setting

Consecutive men and women who presented with acute chief cardiac symptoms to one of the eight EDs between June 2017 and September 2018 were recruited for the study. Recruitment was conducted regularly from Monday to Friday between 8:00 and 17:00 h and intermittently in the evenings and on weekends. Eight nurses were specifically trained on the study protocol so that one trained nurse was present at each study site to enroll for the study.

All patients underwent initial evaluation to rule out a life-threatening condition. Medically stable patients without ACS were identified and screened for inclusion into the study by the trained study nurses, who then approached eligible patients in the ED. It is important to emphasize that the exclusion of a life-threatening cardiac condition did not exclude the presence of cardiac affections.

The data collection process was divided into three sections. First, for the self-reported assessment of MHCs, patients completed a questionnaire during their waiting time in the ED. The

survey was conducted electronically via mobile tablet computers employing validated psychometric screening instruments for MHCs. Additionally, sociodemographic information was obtained. The trained study nurses assisted patients when help was needed (e.g., with data entry). Second, for the validation of MHCs and as the criterion standard for the presence of mental disorders, a subsample of approximately one-third of included study patients underwent a structured clinical interview for diagnosing mental disorders to assess the diagnostic accuracy between self-report MHC measures and an interviewer-administered assessment. The selection method was to ask every patient, according to a fixed selection rate for every ED study site, until the intended quota was achieved. The interview was conducted via telephone by trained clinical psychologists within 4 weeks after the patients' initial ED visit. The interviewers were blinded to the assessment results undertaken in the ED (e.g., medical diagnoses, MHC outcomes). Third, medical data were collected from patients via self-report and from electronic health records (EHRs) by the trained study nurses and research assistants using a customized electronic case report form (REDCap).

Any study-related measures that may have interfered with the routine emergency care situation were avoided and patients could decline study participation or drop out of the study without any negative effect on their care. ED staff was blinded to the results of the psychometric assessment undertaken in the ED; however, a risk management procedure was established and ED staff was informed in case of positive screening for suicidal ideation or behavior.

The study complied with the Declaration of Helsinki. The research protocol was approved by the Data Protection Office and the Ethics Committee of the Faculty of the Charité–Universitätsmedizin Berlin (EA1/363/16). Written informed consent was obtained from patients. The study was registered at ClinicalTrials.gov (NCT03188861). We followed the STROBE statement in the development and reporting of this study[34] (please see Appendix S1 [available as supporting information in the online version of this paper, which is available at http://onlinelibrary.wiley.com/doi/10.1111/acem.14349/full] for the English language version of the EMASPOT study questionnaire used to collect patient-reported outcomes).

Participants

Inclusion criteria were as follows: (1) suspected ACS with at least one of the following cardiac symptoms—chest pain, chest tightness, dyspnea, blood pressure problems, racing heart (tachycardia), palpitation, other cardiac arrythmias, leg edema, or weight gain (>5 kg within 3 months); (2) age ≥50 years; and (3) somatic multimorbidity (two or more chronic diseases). Multimorbidity was assessed using the Charlson Comorbidity Index classification of comorbidities[35] (please see Appendix S2 for more information on the types of chronic diseases). Exclusion criteria were as follows: (1) confirmed acute myocardial infarction, (2) insufficient literacy and language skills, (3) impairments or legal guardianship impeding patients to give written informed consent, and (4) participation in another EMANet study.

Variables

Primary outcome: MHCs

Although the American Psychiatric Association released the *Diagnostic and Statistical Manual of Mental Disorders*, Fifth Edition (DSM-5), in 2013,[19] corresponding standardized and validated interviews and tests were not available in all languages at that time. The German version of the Structured Clinical Interview for DSM-5 Disorders (SCID-5) was published in 2019, which was after the recruitment period of this study. Therefore, MHCs were assessed in accordance with the diagnostic criteria of the DSM, Fourth Edition (DSM-IV).[36] Notably, only minimal diagnostic changes from DSM-IV to DSM-5 have been made for the MHCs assessed in this study. Criteria for major depressive episode/disorder, generalized anxiety disorder, and panic disorder are similar between DSM-IV and DSM-5 (except from the conceptual separation of panic disorder and agoraphobia in the DSM-5, but agoraphobia was not assessed in this study). This allows interpretation of the present study results in relation to similar research employing DSM-IV and DSM-5 criteria.

To screen for the aforementioned MHCs, the German version of the Patient Health Questionnaire (PHQ)[37] was used. The PHQ is a well-established and validated self-report questionnaire widely used in research and clinical practice. The following three modules of the PHQ were included in the screening battery:

Depression (PHQ-9)

Depression was assessed using the PHQ nine-item depression module (PHQ-9).[38] Patients were asked how often, over the past 2 weeks, they have been bothered by depressive symptoms, rated on a four-point scale (0–3) from "not at all" to "nearly every day," leading to a total score that ranges from 0 to 27. PHQ-9 total score of ≥10 represents a moderate to severe level of depression and is indicative of a suspected diagnosis of depression. PHQ-9 showed good sensitivity (88%) and specificity (88%) for detecting depressive disorders in primary care patients, and the internal consistency was good (Cronbach's $\alpha = 0.89$).[39] In this study, internal consistency was acceptable (Cronbach's $\alpha = 0.74$).

Generalized anxiety disorder (GAD-7)

Generalized anxiety was assessed using the generalized anxiety disorder seven-item module (GAD-7).[40] Patients were asked how often, over the past 2 weeks, they have been bothered by generalized anxiety symptoms, rated on a four-point scale (0–3) from "not at all" to "nearly every day," leading to a total score that ranges from 0 to 21. GAD-7 total score of ≥10 represents a moderate to severe level

of generalized anxiety and is indicative of a suspected diagnosis of generalized anxiety disorder. GAD-7 showed good sensitivity (89%) and specificity (82%) for detecting generalized anxiety disorder in primary care patients, and the internal consistency was excellent (Cronbach's $\alpha = 0.92$).[40] In this study, internal consistency was good (Cronbach's $\alpha = 0.81$).

Panic disorder (PHQ-PD)

The panic disorder module from the PHQ contains 15 items and evaluates the presence (no/yes) of a panic disorder (PHQ-PD).[41,42] For diagnosing panic disorder, the original scoring algorithm was used, which requires that the first four responses are positive (including "In the last four weeks, have you had an anxiety attack—suddenly feeling fear or panic?") followed by the presence of four or more somatic symptoms during an anxiety attack. PHQ-PD showed good sensitivity (75%) and specificity (96%) for detecting panic disorder in medical and psychosomatic outpatients.[43] Because items are categorical and include a skip pattern with conditional response, calculation of internal consistency is not recommended for this scale.

Structured clinical-diagnostic interview (SCID)

For state-of-the-art assessment of current mental disorders, the German version of the Structured Clinical Interview for DSM-IV (SCID)[44] was administered via telephone by experienced clinical psychologists for diagnosing depression (module A—mood episodes, module D—mood disorders), generalized anxiety disorder, and panic disorder (module F—anxiety disorders). All SCID interviewers underwent SCID training, had ongoing practice, and had monthly supervision to review interviews and reduce rater drift.

Secondary outcomes

Sociodemographic information

Sociodemographic variables included age, gender, marital status, education level, and occupational status and were assessed via self-report.

Medical information

Routine medical variables were extracted from EHRs. In addition to EHR data extraction, further information on somatic comorbidity, prior diagnoses of mental illness (e.g., depression, anxiety disorder), utilization of mental health treatment, and cardiovascular history and risk factors (e.g., height and weight to calculate the body mass index and behavioral measures such as smoking and alcohol consumption) was obtained directly from patients via self-report. Also, patients estimated on four-point scales (1–4) when their current cardiac symptoms first started, how frequently symptoms occurred, and how urgently they needed treatment. Patients rated their symptom severity on a scale from 0 to 10 (see Appendix S1).

Psychosocial distress (PHQ-stress)

Psychosocial stress was assessed using the stress module from the PHQ (PHQ-stress).[37] It measures psychosocial strain during the past 4 weeks by 10 items relating to health, work/financial, social, and traumatic stress, rated on a three-point scale (0–2) from "not bothered at all" to "bothered a lot" and leading to a total score that ranges from 0 to 20, which represents the severity of stress. A validated cutoff score is not available for this scale.

Health-related quality of life (SF-12v2)

Health-related quality of life (HRQoL) was assessed using the Short-Form Health Survey (SF-12 version 2).[45,46] This 12-item generic questionnaire measures perceived HRQoL in relation to physical, psychological, and social aspects. SF-12v2 contains the following scales: general health, physical functioning, role physical, bodily pain, vitality, social functioning, mental health, and role emotional, yielding two component scores for physical and mental health.

Recognition and treatment rates of MHCs

To examine recognition of depression and anxiety disorder during the ED visit, ED medical records created by the attending ED physicians to document the ED visit were assessed, specifically for patients screened positive for any of the comorbid MHCs assessed with the PHQ modules. It is important to note, however, that ED physicians followed standard operational procedures and clinical routines, and they were not study-related instructed to identify patients with clinically significant depression and anxiety by means of any diagnostic instruments or interviews.

To assess utilization of mental health care, patients were asked whether they received inpatient or outpatient treatment due to psychological problems in the past 6 months prior to the ED visit, e.g., psychopharmacotherapy, psychotherapy, or counseling. They were also asked whether they took any medication for the treatment of anxiety, depression, sleep disorder, or stress at the time of the ED visit.

Statistical methods

The magnitude of group differences was assessed by the difference in means for continuous variables or difference in proportions for categorical variables with the 95% confidence interval (CI). To address missing values of the PHQ modules (i.e., PHQ-9, GAD-7, and

PHQ-PD) as the primary outcome, a single imputation method was applied: in accordance with the PHQ manual[37] and previous studies employing PHQ modules,[47–49] missing values were replaced with the individual mean value of the remaining items of the scale if the number of missing items was below 20%. If the number of missing items exceeded 20%, the total score was not computed and counted as missing. The diagnostic accuracy between MHCs assessed by the three PHQ modules and the SCID as the criterion standard were evaluated by means of confusion matrices (i.e., sensitivity, specificity, and correct classification). All statistical analyses were performed in SPSS (Version 27.0. IBM Corp).

RESULTS

Participants

A total of 2886 patients were assessed for eligibility. Figure 1 shows the patient flow chart with reasons for exclusion from the study and nonresponse. Nonresponders were slightly older (mean ± SD = 70.1 ± 11.1 years) compared with responders (mean ± SD = 68.3 ± 10.8 years; difference in means = 1.7, 95% CI = 0.6–2.9) but did not differ significantly in gender (nonresponders—43.2% women and 56.8% men; responders—41.6% women and 58.4% men; difference in proportions = 1.6%, 95% CI = −3.6 to 6.8).

Descriptive data

A final sample of 641 patients was included in this study with 41.7% women and 58.3% men aged between 50 and 96 years (mean ± SD = 68.8 ± 10.8 years). The leading cardiac symptoms at ED presentation were chest pain (47.9%) and dyspnea (45.2%).

Most patients enrolled arrived in the ED between 8:00 and 17:00 h (83.3%). Patients were assigned level "immediate" (0.5%), "very urgent" (36.9%), "urgent" (45.8%), "standard" (15.1%), and "nonurgent" (1.6%) by the triage officer using the Manchester Triage System. After completion of the examinations in the ED, patients were either transferred to specialized hospital wards for inpatient care (66.8%) or discharged from the ED (33.2%). Complete study data were collected from 80.3% of patients and the amount of missing data ranged between 0.2% and 6.6% depending on the specific variable.

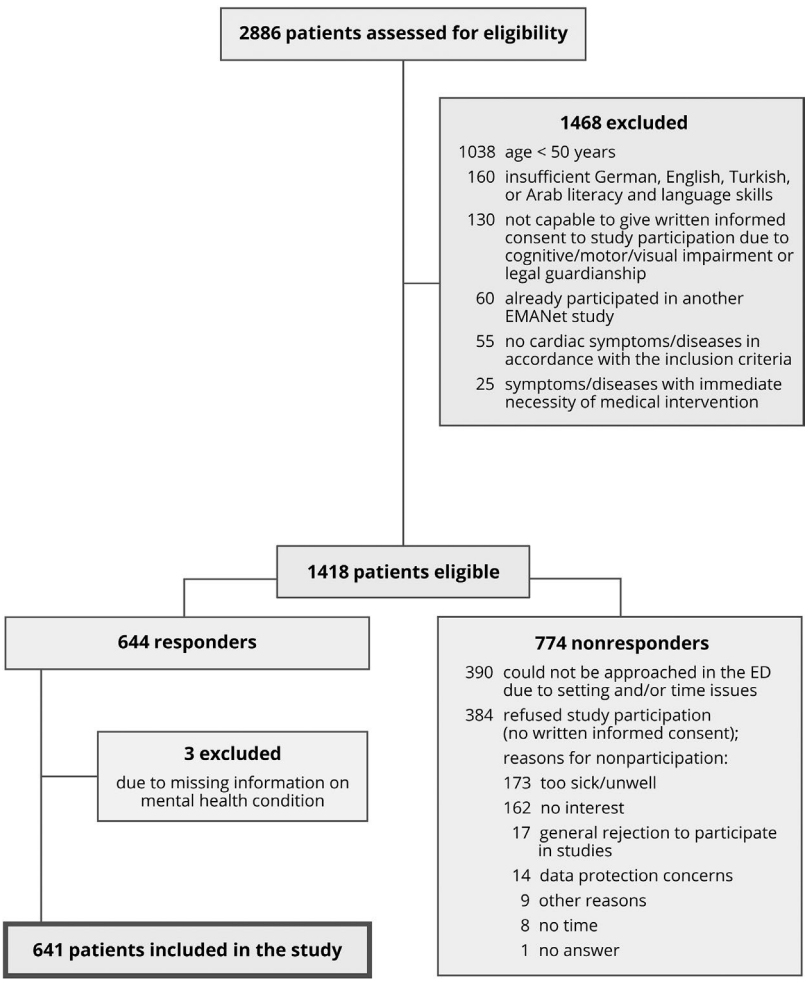

FIGURE 1 Flow chart of patients assessed for study eligibility and participation. A total of 2886 patients were assessed for eligibility; thereof 50.9% of patients were excluded due to not meeting the inclusion criteria, and 49.1% of patients were eligible for participation. Of the eligible patients, 27.5% could not be approached in the ED by the trained study nurses due to setting and/or time issues, and 27.1% did not consent

Main results

Prevalence of MHCs in patients with cardiac symptoms in the ED

Based on PHQ screening, a total of 28.4% of patients were identified with current MHCs. With respect to depression, PHQ-9 scores ranged from 0 to 24 and the mean (±SD) score was 6.0 (±5.0), with 23.3% of patients having a PHQ-9 score of ≥10, indicating clinically significant symptoms of depressive disorder. With respect to generalized anxiety, GAD-7 scores ranged from 0 to 21 and the mean (±SD) score was 3.8 (±4.4), with 12.2% of patients having a GAD-7 score of ≥10, indicating clinically significant symptoms of generalized anxiety disorder. With respect to panic disorder as assessed with the PHQ-PD, 4.7% of patients reported clinically significant symptoms of panic disorder. Overall, 18.3% of patients had one of these MHCs and 10.1% had two or more. A significant degree of overlap was observed between depression (PHQ-9), generalized anxiety (GAD-7), and panic disorder (PHQ-PD; see Figure 2). Therefore, these three MHCs were summarized to one category for further group comparisons of patients with and without MHCs. This is in line with previous research showing that depression and anxiety frequently co-occur in cardiac patients.[17,50,51]

Diagnostic accuracy between PHQ modules and SCID

For the assessment of diagnostic accuracy between PHQ modules (i.e., PHQ-9, GAD-7, and PHQ-PD) and SCID, 207 SCID interviews were conducted on a subsample of 32.3% of patients of the study sample. The mean (±SD) length of time between administration of PHQ modules and SCID was 14.8 (±8.5) days. There were no significant differences between patients who did versus did not undergo the SCID interview regarding age (no-SCID—mean ± SD = 68.9 ± 11.0 years; SCID—mean ± SD = 68.7 ± 10.4 years; difference in means = 0.2, 95% CI = −1.6 to 2.0) and gender (no-SCID—41.5% women and 58.5% men; SCID—42.0% women and 58.0% men; difference in proportions = −0.5%, 95% CI = −8.7 to 7.7). However, there was a small significant difference in education: patients who did not undergo the SCID interview had a lower education level (28.4% tertiary and 71.6% primary/secondary) compared to patients who underwent the SCID interview (37.2% tertiary and 62.8% primary/secondary; difference in proportions = −8.8%, 95% CI = −16.7 to −1.0).

Based on the SCID, a total of 15.0% of patients were identified with current MHCs; 10.6% of patients met DSM-IV criteria for depressive episode/disorder, 1.4% met DSM-IV criteria for generalized anxiety disorder, and 7.7% met DSM-IV criteria for panic disorder. The correct classification rate was between 81.2% and 92.8% depending on the specific PHQ module. Specificity of PHQ-9, GAD-7, and PHQ-PD was good, while sensitivity was moderate, and between 33.3% and 62.5% of patients with actual MHC according to the SCID went undetected (see Table 1).

Characteristics of patients with and without MHCs

Sociodemographic characteristics

As shown in Table 2, patients with MHCs were younger and more likely to be female, lower educated, and unemployed compared to patients without MHCs, but there were no significant differences with respect to marital status.

Medical characteristics

Medical characteristics of patients with and without MHCs are provided in Table 3. Both groups were similar regarding most medical variables assessed at ED presentation such as arrival time, triage category, pathway, cardiac symptoms, and cardiovascular history and risk factors. Notably, patients with MHCs were significantly more likely to suffer from obesity compared to the group of patients without MHCs.

Although the overall somatic multimorbidity index did not differ between patients with and without MHCs, MHCs were more prevalent in patients with connective tissue disease (difference in proportions = −9.3%, 95% CI = −14.5 to −4.1) and in those with mild liver disease (difference in proportions = −8.9%, 95% CI = −14.3 to −3.5). This finding might suggest that rates of comorbid MHCs may vary across specific chronic diseases (see Appendix S2).

Significant group differences were observed regarding cardiac symptom burden when patients were asked about the duration, frequency, and severity of their current cardiac symptoms as well as treatment urgency. Patients with MHCs reported more often that their symptoms started more than 1 week ago and had occurred before. Also, they rated their cardiac symptoms as more severe requiring more urgent treatment compared to patients without MHCs (see Table 4).

Psychological characteristics

As displayed in Table 5, in comparison to patients without MHCs, patients with MHCs reported significantly more psychosocial distress (PHQ-stress) as well as significantly lower scores on the physical and mental HRQoL indices (SF-12v2), which indicates poorer functioning in those two domains.

Recognition and treatment rates of MHCs

Patients were asked whether they suffered from mental illness, e.g., depression or anxiety disorder, preceding study participation. In the total study sample, 9.7% reported a prior diagnosis of mental illness; depression was reported by 6.7%, and anxiety disorder was reported by 2.7%. Of the 182 patients who screened positive for comorbid MHCs assessed with the PHQ modules, 22.5% reported a prior diagnosis of mental illness; depression was reported by 14.8%, and anxiety disorder was reported by 7.7%.

With respect to utilization of mental health care, patients were asked whether they took any medication for the treatment

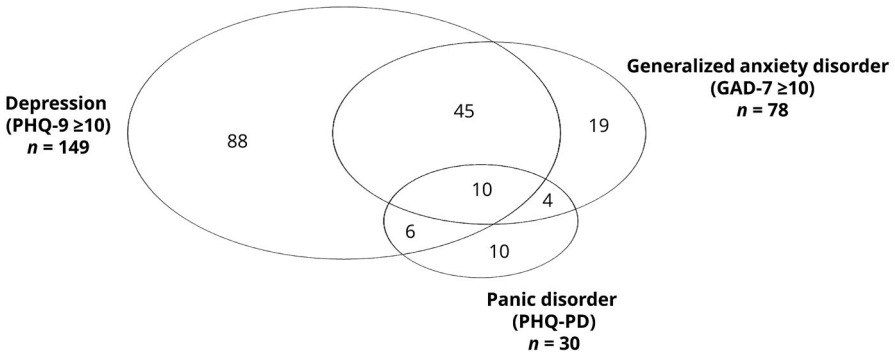

FIGURE 2 Venn diagram of overlap between symptoms of depression (PHQ-9), generalized anxiety disorder (GAD-7), and panic disorder (PHQ-PD) among ED patients with cardiac symptoms. GAD-7, generalized anxiety disorder seven-item module; PHQ-9, Patient Health Questionnaire nine-item depression module; PHQ-PD, Patient Health Questionnaire panic disorder module

TABLE 1 Diagnostic accuracy of the PHQ-9, GAD-7, and PHQ-PD compared to SCID diagnoses

MHC	True positive (sensitivity)	True negative (specificity)	False positive (Type I error)	False negative (Type II error)	Correct classification (efficiency)
PHQ-9 ≥10 Depression	50.0 (43.2–56.8)	84.9 (80.0–89.8)	15.1 (10.2–20.0)	50.0 (43.2–56.8)	81.2 (75.9–86.5)
GAD-7 ≥10 Generalized anxiety disorder	66.7 (60.3–73.1)	87.7 (83.2–92.2)	12.3 (7.8–16.8)	33.3 (26.9–39.7)	87.4 (82.9–91.9)
PHQ-PD Panic disorder	37.5 (30.9–44.1)	97.4 (95.2–99.6)	2.6 (0.4–4.8)	62.5 (55.9–69.1)	92.8 (89.3–96.3)

Note: Data are reported as % (95% CI). The SCID interview served as the criterion standard and was conducted on a subsample of 207 patients, i.e., 32.3% of patients of the total study sample.

Abbreviations: GAD-7, generalized anxiety disorder seven-item module; MHC, mental health condition; PHQ-9, Patient Health Questionnaire nine-item depression module; PHQ-PD, Patient Health Questionnaire panic disorder module; SCID, Structured Clinical Interview for DSM-IV.

of anxiety, depression, sleep disorder, or stress at the time of the ED visit and whether they received inpatient or outpatient treatment due to psychological problems in the past 6 months prior to the ED visit, e.g., psychopharmacotherapy, psychotherapy, or counseling. In the total study sample, 16.8% reported to currently receive psychopharmacotherapy, and 10.7% reported receiving some form of mental health treatment in the past 6 months. Among the 182 patients screened positive for comorbid MHCs, 26.8% reported to currently receive psychopharmacotherapy, and 23.6% reported receiving some form of mental health treatment in the past 6 months.

To examine recognition of depression and anxiety disorder during the ED visit, ED medical records created by the attending ED physicians to document the ED visit of those patients screened positive for comorbid MHCs were assessed. A diagnosis of depression or anxiety disorder was documented in 9.3% of the cases. Of these, for 5.5%, depression and anxiety diagnoses were based on a prior diagnosis (i.e., known as preexisting condition either already listed in the EHR system or reported by patients), and for another 3.8%, depression and anxiety disorder were newly diagnosed within the current encounter and based on the clinical assessment of the ED physicians (1.6%) or consulted psychiatrists (2.2%). Two patients were diagnosed with panic disorder as the main cause for ED presentation. Notably, in 3.8% of the cases, discharge instructions contained recommendations of mental health treatment (psychotherapy and/or psychopharmacotherapy).

Taken together, of the 182 patients who screened positive for comorbid MHCs, 45.1% already had a prior depression and/or anxiety diagnosis, were treated, and/or were recognized during the ED visit. Thus, 54.9% of patients were identified with new or unrecognized MHCs.

DISCUSSION

Key results

This study presents a comprehensive evaluation of MHCs in older multimorbid patients presenting to the ED with acute cardiac symptoms and exclusion of acute myocardial infarction. The major finding is that a substantial proportion of 28.4% of patients suffered from comorbid MHCs at the time of the ED visit, comprising moderate to severe symptoms of depression (23.3%), generalized anxiety disorder (12.2%), and panic disorder (4.7%). Among patients with MHCs, approximately two-thirds had one of these MHCs and one-third had two or more.

LIMITATIONS

First, many eligible patients could not be recruited to this study due to either setting and time issues or non-consent. The examination

TABLE 2 Sociodemographic characteristics stratified by MHC

Variable	No MHC, $n = 459$, 71.6%	MHC, $n = 182$, 28.4%	Effect size	95% CI
Age (years)	69.7 (±10.9)	66.8 (±10.3)	2.9[a]	1.1–4.8
Gender				
Male	286 (62.3)	88 (48.4)	13.9[b]	5.4–22.4
Female	173 (37.7)	94 (51.6)	−13.9[b]	−22.4 to −5.4
Marital status[c]				
Single (and never married)	55 (12.1)	32 (17.6)	−5.5[b]	−11.8 to 0.8
Married (and living together)	233 (51.4)	86 (47.3)	4.1[b]	−4.5 to 12.7
Separated/divorced/widowed	165 (36.4)	64 (35.2)	1.2[b]	−7.0 to 9.4
Education level[c]				
Primary	125 (27.5)	59 (32.4)	−4.9[b]	−12.8 to 3.0
Secondary	174 (38.3)	79 (43.4)	−5.1[b]	−13.6 to 3.4
Tertiary	155 (34.1)	44 (24.2)	9.9[b]	2.3–17.5
Occupational status[c]				
Retired	295 (64.4)	111 (61.0)	3.4[b]	−4.9 to 11.7
Employed	148 (32.3)	41 (22.5)	9.8[b]	2.4–17.2
Unemployed[d]	15 (3.3)	30 (16.5)	−13.2[b]	−18.8 to −7.6

Note: Data are reported as *n* (%) or mean (±SD).

Abbreviation: MHC, mental health condition.

[a]Difference in means.

[b]Difference in proportions (%).

[c]There were missing data for marital status ($n = 6$), education level ($n = 5$), and occupational status ($n = 1$).

[d]This category includes unemployment ($n = 18$), unemployment due to disability ($n = 22$), housewife/househusband ($n = 2$), and other ($n = 3$).

of baseline characteristics of the enrolled and nonenrolled patients indicated that patients older than 70 years were less likely to participate. Also, the subsample of patients who underwent the SCID interview had a higher education level compared to patients without interview.

Second, for the assessment of MHCs, patients completed self-administered, reliable, and valid screening questionnaires during the ED visit. State-of-the-art diagnosis of mental disorder was conducted in a subsample after the ED visit within a narrow time window of 15 days on average. Although these time gaps are reasonable and quite common in clinical research,[43,52] it is possible that variation in time point of assessment might have contributed to diagnostic disagreement.

Third, while this study uncovered the frequency of comorbid MHCs in patients presenting to the ED with acute cardiac symptoms, the present cross-sectional analysis did not allow for the causal mechanism by which this association existed. Last, heterogeneity of the hospital-based EDs with respect to the number of patients treated per year, ownership (i.e., public, private, teaching, and church hospitals), and services offered (e.g., affiliated chest pain unit, availability of consultation–liaison psychiatry service) limited comparability between EDs.

Interpretation

Our results are consistent with those of other recent research in EDs and acute care units. Studies employing the same self-report screening instruments in patients with chest pain found prevalence rates between 12% and 34% for depression[25–28] and between 10% and 30% for generalized anxiety disorder.[25,28,29] Previous research assessing current panic disorder by means of structured interviews found that between 6% and 34% of patients with chest pain met the diagnostic criteria for panic disorder.[11,30–32] Taken together, the results suggest that MHCs such as depression, generalized anxiety, and panic disorder are highly prevalent among patients with cardiac symptoms in emergency and acute care settings.

Methodological differences across studies and selection effects as well as the heterogeneity of health care systems across countries might explain the somewhat lower prevalence of MHCs in this study compared to previous studies; specifically, rates of panic disorder were lower than expected. Contrary to most other studies that investigated MHCs in the ED, we examined a cohort of older and multimorbid patients who presented to one of eight EDs with a variety of acute cardiac symptoms and chronic diseases. A systematic review by Tully et al.[53] reported a panic disorder prevalence of 6.8%

TABLE 3 Medical characteristics at ED presentation stratified by MHC

Variable	No MHC, *n* = 459, 71.6%	MHC, *n* = 182, 28.4%	Effect size	95% CI
Arrival time[a]				
08:01–17:00 h	379 (84.8)	155 (87.6)	−2.8[b]	−8.7 to 3.1
17:01–08:00 h	68 (15.2)	22 (12.4)	2.8[b]	−3.1 to 8.7
Triage category (Manchester Triage System)[a]				
Immediate, very urgent, urgent (1 red–3 yellow)	358 (82.1)	149 (86.1)	−4.0[b]	−10.3 to 2.3
Standard, nonurgent (4 green–5 blue)	78 (17.9)	24 (13.9)	4.0[b]	−2.3 to 10.3
Cardiac symptoms				
Chest pain	230 (50.1)	77 (42.3)	7.8[b]	−0.7 to 16.3
Chest tightness	117 (25.5)	45 (24.7)	0.8[b]	−6.6 to 8.2
Dyspnea	198 (43.1)	92 (50.5)	−7.4[b]	−16.0 to 1.2
Blood pressure problems	102 (22.2)	43 (23.6)	−1.4[b]	−8.6 to 5.8
Racing heart (tachycardia)	108 (23.5)	44 (24.2)	−0.6[b]	−8.0 to 6.6
Palpitations	48 (10.5)	31 (17.0)	−6.6[b]	−12.6 to −0.4
Other cardiac arrhythmias	107 (23.3)	37 (20.3)	3.0[b]	−4.0 to 10.0
Leg edema	34 (7.4)	24 (13.2)	−5.8[b]	−11.3 to −0.3
Weight gain (>5 kg within 3 months)	6 (1.3)	3 (1.6)	−0.3[b]	−2.4 to 1.8
Pathway				
Outpatient care and discharge from the ED	145 (31.6)	68 (37.4)	−5.8[b]	−14.0 to 2.4
Hospital admission	314 (68.4)	114 (62.6)	5.8[b]	−2.4 to 14.0
Cardiovascular history				
Coronary heart disease	189 (41.2)	71 (39.0)	2.2[b]	−6.2 to 10.6
Previous myocardial infarction	68 (14.8)	23 (12.6)	2.2[b]	−3.6 to 8.0
Heart failure	163 (35.5)	74 (40.7)	−5.1[b]	−13.6 to 3.2
Arrhythmia	270 (58.8)	97 (53.3)	5.5[b]	−3.0 to 14.0
Cardiovascular risk factors				
Arterial hypertension	382 (83.2)	145 (79.7)	3.6[b]	−3.3 to 10.3
Dyslipidemia	235 (51.2)	91 (50.0)	1.2[b]	−7.4 to 9.8
Obesity (body mass index ≥30 kg/m²)	142 (30.9)	77 (42.3)	−11.4[b]	−19.7 to −3.1
Diabetes mellitus	101 (22.0)	49 (26.9)	−4.9[b]	−12.4 to 2.6
Family history of heart disease[c]	30 (6.5)	13 (7.1)	−0.6[b]	−5.0 to 3.8
Smoking				
Past smoker	114 (24.8)	40 (22.0)	2.9[b]	−4.4 to 10.0
Current smoker	68 (14.8)	33 (18.1)	−3.3[b]	−9.8 to 3.2
Problematic alcohol consumption (PHQ-alcohol)[a,d]	17 (3.7)	10 (5.5)	−1.8[b]	−5.5 to 1.9
Somatic multimorbidity (Charlson Comorbidity Index; adjusted for age)	4.0 (±2.2)	4.2 (±2.8)	−0.2[e]	−0.6 to 0.3

Note: Data are reported as *n* (%) or mean (±SD).

Abbreviations: ED, emergency department; MHC, mental health condition.

[a]There were missing data for arrival time (*n* = 17), triage category (*n* = 32), and problematic alcohol consumption (*n* = 6).

[b]Difference in proportions (%).

[c]A family history of heart disease was defined by having a first- or second-degree male relative (i.e., father or grandfather) who had a heart attack or a sudden cardiac death by age 55 or a first- or second-degree female relative (i.e., mother or grandmother) by age 65.

[d]Alcohol problems were assessed using the Patient Health Questionnaire alcohol abuse/dependence module (PHQ-alcohol). This module consists of five items that correspond to some of the most frequently met diagnostic criteria for alcohol abuse and dependence. A positive "yes" response to any of the items indicates probable alcohol abuse or dependence.

[e]Difference in means.

TABLE 4 Cardiac symptom burden stratified by MHC

Variable	No MHC, *n* = 459, 71.6%	MHC, *n* = 182, 28.4%	Effect size	95% CI
Symptom duration[a]				
Since today	138 (30.9)	42 (23.2)	7.7[b]	0.2–15.2
Since yesterday	69 (15.5)	19 (10.5)	5.0[b]	−0.6 to 10.6
Since a few days	107 (24.0)	36 (19.9)	4.1[b]	−2.9 to 11.1
Since more than 1 week	132 (29.6)	84 (46.4)	−16.8[b]	−25.2 to −8.4
Symptom frequency[a]				
Occurred for the first time	164 (36.7)	49 (26.9)	9.8[b]	2.0–17.6
Occurred once before	53 (11.9)	16 (8.8)	3.1[b]	−2.0 to 8.2
Occur repeatedly	183 (40.9)	89 (48.9)	−8.0[b]	−16.6 to 0.6
Permanently present	47 (10.5)	28 (15.4)	−4.9[b]	−10.9 to 1.1
Treatment urgency[a]				
Highly urgent	153 (34.5)	59 (33.3)	1.2[b]	−7.0 to 9.4
Very urgent	81 (18.3)	58 (32.8)	−14.5[b]	−22.3 to −6.7
Urgent	151 (34.1)	42 (23.7)	10.4[b]	2.7–18.1
Less urgent	58 (13.1)	18 (10.2)	2.9[b]	−2.6 to 8.4
Symptom severity (0 not at all–10 extremely severe)[a]	6.5 (±2.4)	7.4 (±2.1)	−1.0[c]	−1.3 to −0.6

Note: Data are reported as *n* (%) or mean (±SD).

Abbreviation: MHC, mental health condition.

[a]There were missing data for symptom duration (*n* = 14), symptom frequency (*n* = 12), treatment urgency (*n* = 21), and symptom severity (*n* = 8).

[b]Difference in proportions (%).

[c]Difference in means.

TABLE 5 Psychological characteristics stratified by MHC

Variable	No MHC, *n* = 459, 71.6%	MHC, *n* = 182, 28.4%	Effect size	95% CI
Psychosocial distress (PHQ-stress)[a]	2.5 (±2.3)	5.2 (±3.5)	−2.7[b]	−3.3 to −2.2
HRQoL (SF-12v2)[a]				
Physical HRQoL	41.1 (±11.3)	35.0 (±11.3)	6.1[b]	4.1–8.1
Mental HRQoL	56.1 (±7.5)	43.7 (±11.1)	12.4[b]	10.5–14.2

Note: Data are reported as mean (±SD).

Abbreviations: HRQoL, health- related quality of life; MHC, mental health condition; PHQ- stress, Patient Health Questionnaire stress module.

[a]There were missing data for psychosocial distress (*n* = 2) and HRQoL (*n* = 42).

[b]Difference in means.

in patients with coronary heart disease (CHD), which is in line with our rates of panic disorder. They also found that panic disorder prevalence decreased when the percentage of males in the sample increased. This might as well apply to our study with a male proportion of 58.3%. Also consistent with our results, in a study by Greenslade et al.[11] the clinical diagnosis of panic disorder was made in 5.6% of unselected ED patients with chest pain. However, panic disorder prevalence was significantly higher with rates ≥25% in studies examining ED patients presenting for chest pain of noncardiac origin[31] or who were at low to moderate risk for cardiac disease and ACS.[32] Since this study used primarily self-report questionnaires, underreporting of MHCs might have been an issue. It is possible that patients presenting for acute cardiac symptoms were reluctant to report anxiety attacks or depressive mood episodes in the ED due to a fear of being stigmatized or rejected by ED personnel, a fear in the sense that their cardiac symptoms will be solely attributed to a MHC rather than to a cardiac disease and that they will be denied access to somatic diagnostic and treatment. Another potential explanation is that decreased MHC prevalence may be related to improvements in MHC detection. Over the past decades, great efforts have been made in Germany to raise awareness for mental health problems and to adapt the delivery of mental health care to meet demands.

Enabling access to adequate mental health services for diagnosis and treatment might be associated with lowered prevalence rates for comorbid MHCs in the ED.

Comparison of sociodemographics between patients with and without MHCs indicated that age, gender, education level, and occupational status differed between the two groups, with younger age, female gender, lower education, and unemployment more likely to occur in those with MHCs. These findings are consistent with those of a cross-national epidemiological report on sociodemographic correlates of mood and anxiety disorders,[54] suggesting that younger and disadvantaged groups of society are more likely to be affected with MHCs. Our results may indicate that this also holds true for patients with cardiac symptoms and chronic diseases in the ED.

Exploratory analyses of medical variables such as arrival time, triage category, pathway, cardiac symptoms, somatic multimorbidity, and cardiovascular history and risk factors revealed that patients with and without MHCs were similar in their medical characteristics and chronic disease burden at the time of ED presentation. This is consistent with previous research that showed that clinical signs or symptoms routinely collected in the ED as part of the evaluation for ACS and other life-threatening conditions could not be used to distinguish patients with and without panic disorder.[11] However, obesity is a cardiovascular risk factor that was observed more frequently in the group of patients with MHCs. Previous research has demonstrated a reciprocal link between depression and obesity in that obesity was found to increase the risk of clinically significant depression, and in addition, depression was found to be predictive of developing obesity.[55] A positive association between anxiety disorders and obesity has also been documented, but the causal relationship is less clear.[56] Also, MHCs were more prevalent in patients with connective tissue disease and in those with mild liver disease, which might suggest that rates of comorbid MHCs may vary across specific chronic diseases. Given the exploratory approach of our study, the findings must be considered preliminary and further research concerning medical differences between patients with and without MHCs is warranted.

The presence of MHCs was associated with a substantially higher perceived somatic and mental health burden. Our study found that, in comparison to patients without MHCs, patients suffering from comorbid MHCs reported a more pronounced symptom burden and subjective treatment urgency related to their current cardiac symptoms. In addition, they experienced more psychosocial distress and impaired physical and mental HRQoL. Against the background that patients with and without MHCs were similar in their medical characteristics and chronic disease burden, these findings suggest that suffering from comorbid MHCs such as depression and anxiety disorder is not only associated with poorer physical and mental functioning and well-being but also aggravates the cardiac symptom burden and subjective treatment urgency in the ED. This echoes previous research by Wells et al.[57] who has shown that the effect of depressive symptoms, with or without depressive disorder, on a wide range of quality-of-life outcomes is comparable to, and in some cases worse than, the effects of chronic somatic conditions such as hypertension or CHD.

For the screening of MHCs, the PHQ, including PHQ-9, GAD-7, and PHQ-PD, is considered a reliable and valid tool for many patient populations and settings including cardiac patients in the ED.[58–60] As PHQ and SCID are both based on DSM-IV criteria employing the same questions, we expected a stronger diagnostic accuracy between the individual PHQ modules and the SCID. The in a subsample assessed accuracy rates that corresponded to the proportion of patients who have been correctly classified by means of the PHQ-9 (81.2%), GAD-7 (87.4%), and PHQ-PD (92.8%) were good. Nevertheless, the proportion of patients in this subsample incorrectly identified as "patients without MHCs" by means of the PHQ-9 (50.0%), GAD-7 (33.3%), and PHQ-PD (62.5%) is noteworthy, because it indicates that the actual prevalence of MHCs among the total study sample might be higher than reported. Although these rates do not represent the entire study sample, factors associated with disagreement may have involved the fundamental methodological differences not only between self-report measures versus clinical interviews to assess MHCs, but also between face-to-face versus telephone administration, although previous data suggest that telephone administration produces results very similar to face-to-face assessment.[61]

In this study, the original cut-points and scoring algorithms of the screening instruments were used, which produced substantially higher specificity than sensitivity. However, a high detection rate is the first objective for screening instruments. One study by Hyphantis et al.[62] tested whether modified cut-points would increase diagnostic accuracy of the PHQ-9 for detecting depression in patients with chronic diseases (i.e., diabetes mellitus, chronic obstructive pulmonary disease, and chronic inflammatory rheumatic disease) seeking urgent care in the ED. The authors suggested a lower cut-point of eight for optimal discriminatory power, while the conventional cut-point is 10. However, other studies have recommended increasing the PHQ-9 cut-point up to 12 to avoid misattribution of somatic symptoms to depression in patients with chronic somatic diseases.[63] Sung et al.[64] investigated the diagnostic accuracy of the PHQ-PD in detecting panic disorder in ED patients with cardiopulmonary complaints. Consistent with our findings, sensitivity was low (39.1%) and specificity was high (97.2%) when applying the original scoring algorithm. Here again, the authors suggested a modified and less restrictive scoring algorithm to evaluate the presence of panic disorder. It is possible that modified cut-points and scoring algorithms of the PHQ-9, GAD-7, and PHQ-PD would have increased sensitivity and correct identification of depression, generalized anxiety, and panic disorder in our study sample of older multimorbid patients presenting to EDs for acute cardiac symptoms. Yet, further validation studies are needed to confirm the diagnostic accuracy of modified cut-points and scoring algorithms of the individual screening instruments in specific diseases and settings including the ED.

Perhaps it is equally important to take into careful consideration the emergency and acute care situation in which the MHC

screening took place. As mentioned previously, it is possible that our study sample of older multimorbid patients, who sought urgent care in the ED for acute cardiac symptoms, may have felt embarrassed to reveal additional emotional vulnerability in light of the stigmatizing nature of MHCs, leading to underreporting of MHCs in the ED,[62] yet patients may have experienced significant psychological distress during the emergency event itself. Clinically relevant symptoms of anxiety and depression may have developed following the ED visit, perhaps stemming from the experience of acute illness, fear of myocardial infarction, and undergoing medical evaluation for ACS and were thus reported only during the diagnostic interview, which was conducted on average 2 weeks after ED discharge. In fact, an emerging body of literature has focused on the role of psychological stress in acute CVD events and found that the subjective experience of having a "perceived" life-threatening event may lead to the development of affective symptoms of depression, anxiety, and posttraumatic stress disorder, regardless of whether there was an actual CVD diagnosis (see Musey et al.[65] for a review). Taken together, additional research is warranted to further investigate the potential reasons why patients went undetected employing screening instruments.

Among the patients identified with comorbid MHCs, 54.9% were identified with new or unrecognized MHCs. Notably, ED physicians were not instructed to identify patients with comorbid MHCs, neither did they conduct a diagnostic interview required for diagnosing mental disorders. Documentation of diagnoses of depression or anxiety disorder (either based on a prior diagnosis or newly recognized during the ED encounter) was at the ED physician's discretion and might reflect that this information was relevant for the subsequent diagnostic process and/or treatment path. Still, this finding highlights the importance of screening for MHCs among ED patients as clinically significant symptoms of depression, generalized anxiety, and panic disorder have shown to impact cardiac symptom burden and subjective treatment urgency in the ED. Recommendation of routine screening for depression in patients with CVD[66] has attracted heavy criticism in the past, stating that screening using questionnaires or surveys as part of standard cardiac care might be harmful, leading to an overuse of important health care resources, bearing the risk of inappropriate labeling of patients and resulting in an inadequate course of treatment and causing stigma in the absence of benefits on cardiac outcomes.[67] Previous research has shown that screening for MHCs in the ED is feasible.[68] However, implementation of routine screening into emergency and acute care settings, where there is a group of physicians, who generally have neither the time nor the expertise to screen or act on the screening results is challenging. Therefore, future research needs to carefully assess barriers and facilitators as well as risks and benefits of routine MHC screening in the ED. Additionally, it is not enough to develop systems that will encourage ED personnel to screen and patients to seek mental health care. It is also critical that access to qualified mental health care providers is available for those patients with positive screening results to receive timely diagnosis and effective treatment if indicated.

CONCLUSION

In conclusion, mental health conditions comprising clinically significant symptoms of depression, generalized anxiety disorder, and panic disorder were highly prevalent but rarely recognized in older multimorbid patients seeking urgent care for acute cardiac symptoms at inner-city EDs. Suffering from comorbid mental health conditions was associated with a substantial somatic burden with respect to the duration, frequency, and severity of the cardiac symptoms as well as their subjective treatment urgency. Furthermore, patients with mental health condition reported more psychosocial distress and greater quality-of-life impairments.

Regarding clinical implications, we believe that the ED visit offers an opportunity for ED personnel to identify and refer cardiac patients with comorbid mental health conditions to adequate and timely mental health care. As demonstrated in this study, approximately one in four patients suffered from comorbid mental health conditions at the time of the ED visit. Our research activity now focuses on the development, piloting, evaluation, and implementation of a psychocardiological training program specifically targeted at physicians and nurses working in the ED as a measure to raise awareness for mental health problems affecting cardiac symptoms and to improve the clinician–patient communication. Interventions for improved quality of emergency care could include, for example, providing educational information to patients about the bidirectional relationship between physical and mental health problems and how somatic conditions can be exacerbated by comorbid mental health conditions. Existing research evaluating the effectiveness of psychocardiological training programs for health professionals working in cardiology and cardiac rehabilitation[69–71] as well as research studying the effects of psychoeducation on mental health in patients with cardiovascular disease[72] seem promising that ED personnel and patients might benefit from such trainings and interventions in the ED setting. It is important to bear in mind that the ED visit itself may impact future mental health.

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CONFLICT OF INTEREST

The authors have no potential conflicts to disclose.

AUTHOR CONTRIBUTIONS

Martin Möckel conceived and initiated the research network EMANet and obtained research funding. Liane Schenk is co-speaker of EMANet. Martin Möckel and Matthias Rose are the principal investigators of the subproject EMASPOT and Martin Möckel, Matthias Rose, Andrea Figura, and Anna Slagman

designed the study. Andrea Figura and Stella L. Kuhlmann developed the study protocol including research questions and methods of evaluation, supervised the conduct of the study and data collection, and analyzed and interpreted the data. Andrea Figura drafted the manuscript, and all co-authors contributed substantially to its revision. Andrea Figura drafted the final version, which all authors read and approved.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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