




ORIGINAL ARTICLE

Predictors for COVID-19-related new-onset maladaptive behaviours in children presenting to a paediatric emergency department

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Background and Objective: The goal of the present study was to determine the incidence of new onset maladaptive behaviours in paediatric emergency department (PED) patients during the COVID-19 pandemic and to examine whether child and parent anxiety and parental health status were predictors for the new-onset of maladaptive behaviours.

Methods: Participants included child–parent dyads seen in a PED following the state's issuance of mandatory stay-at-home orders on 19 March 2020. A total of 351 children age 0–25 years and 335 parents enrolled in the study. Parents provided baseline demographic data and completed standardised surveys that assessed aspects of parental and child anxiety and parental health, as well as child new-onset maladaptive behaviours. Children ≥ 8 years of age completed surveys that assessed child anxiety.

Findings: Parents reported the new onset of maladaptive behaviours in children during the pandemic with frequencies up to 43%. Bivariate analysis identified predictors such as child anxiety ($t(96) = -2.04, P = 0.044$) as well as parental variables such as state anxiety ($t(190) = -4.91, P < 0.001$) and parental sensitivity to anxiety ($t(243) = -3.19, P = 0.002$). A logistic regression model identified parent mental health and COVID-19 anxiety as predictors of new onset maladaptive behaviours in children ($\chi^2(6) = 42.514, P < 0.001$). Specifically, every unit change in parental anxiety of COVID-19 was associated with a unit increase in maladaptive behaviours in children.

Conclusions: We identified distinct parent and child-related factors that predicted new onset child maladaptive behaviours during the COVID-19 pandemic. The identification of such predictors may help clinicians to prevent maladaptive responses to the pandemic quarantine.

Key words: behavioural; COVID-19; emergency medicine; paediatric; psychiatry/mental health.

What is already known on this topic

1 New onset negative maladaptive behavioural changes in healthy children of all ages have been identified during the COVID-19 pandemic.

What this paper adds

1 A high percentage of children who presented to the emergency department during the COVID-19 pandemic exhibited parent reported new-onset maladaptive behaviour.
2 Parent mental health and COVID-19 anxiety are predictors for new onset maladaptive behaviours in their children.

COVID-19 was first diagnosed in Wuhan City, China, in December 2019. By March 2020, the World Health Organisation had declared

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Author Contributions: TH and ZK conceptualised and designed the study, drafted the initial manuscript and reviewed and revised the manuscript. MF conducted the statistical analysis, drafted portions of the initial manuscript and reviewed and revised the manuscript. SM drafted portions of the initial manuscript and reviewed and revised the manuscript. KB and BL conducted study activities. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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a global pandemic. Although the knowledge base regarding children's responses to the COVID-19 pandemic has been expanding, descriptions of children's responses to pandemics remain scarce.¹ Previous studies showed that children who are isolated or quarantined during pandemics are more likely to develop acute stress disorder, adjustment disorder and grief.² The psychological impact on youth stems from stressors such as fears of infection, frustration, boredom, inadequate information, lack of in-person social contact, lack of personal space at home and financial strain on the family.³ Studies conducted in China during the COVID-19 pandemic showed increased levels of anxiety and depression as well as an increase in clinging and irritability among children of all ages.^{4,5}

Numerous studies published to date have established the impact of parental emotional/behavioural functioning on the emotional/behavioural functioning of the child.^{6,7} New-onset maladaptive (negative psychological) reactions such as general anxiety, nighttime crying, enuresis, separation anxiety and temper tantrums have been reported to be a result of stressful events such as surgery and are highly affected by child anxiety and a number of parental factors.^{8,9}

Because there is evidence that children presenting to the PED experience significant anxiety,¹⁰ one could hypothesize that such anxiety would be significantly heightened during a pandemic and would lead to increased incidence of new onset maladaptive behaviours. Identification of predictors to such new-onset pandemic-related maladaptive behaviours may inform treatment.⁴ The goal of the present study was to determine the incidence of new-onset maladaptive behaviours in PED patients during the COVID-19 pandemic and to identify child and parent predictors for these behaviours.

Methods

Study population

The study was conducted at a PED in the Southwestern United States during the period from March 25 to April 26, 2020. This period immediately followed the state's mandatory stay-at-home orders, which were issued on 19 March 2020. All participants were considered exposed to the mandatory quarantine. Participant dyads included children ($n = 351$) and parents ($n = 335$) who visited the PED. Sixteen parents presented with more than one child to the PED. Among the children included in the study, 33.9% were considered to have possible symptoms for COVID-19 and 9.5% of children received a test for identification of SARS-CoV-2. Parent-child dyads who were not fluent in English were excluded from the study, as were those who were seeking ED care for a behavioural or psychiatric issue. There was a total of 3081 visits to the ED during the study period. Of these visits, 560 reported a primary language other than English and 114 presented with a primary psychiatric chief complaint. A list of chief complaints during the study period can be found in Table S1. Institutional review board reviewed and approved the study and verbal assent was obtained from all parents.

Measures

Demographic data

Data related to demographic characteristics were obtained by asking parents to complete a 15-item demographic questionnaire.

Predictors

Parental COVID-19 Anxiety was measured via a self-report questionnaire previously validated for identifying psychological predictors of anxiety in response to a pandemic.¹¹ The questionnaire was used to assess perceived likelihood of contracting COVID-19, perceived severity of infection, avoidance of certain places and people, use of safety behaviours and degree of exposure to virus-related information. The five-point scale for responses ranges from 0 (*very little*) to 4 (*very much*). Items that assessed concerns about H1N1 virus were revised for the investigation of concerns about COVID-19, based on previous research and clinical observations.¹¹

Parental State Anxiety was evaluated with a self-reported Visual Analogue Scale for Anxiety (VAS-A) by answering questions using a 10-cm horizontal line that extended from the anchor of "not anxious" to the anchor of "very anxious". This tool has been validated against other measures of anxiety (e.g. Spielberger State, Trait Anxiety Inventory).¹²

Parental Sensitivity to Anxiety was measured with the Anxiety Sensitivity Index-3 (ASI-3),¹³ a parent self-report tool that assesses beliefs about the feared consequences of symptoms

associated with anxious arousal. Respondents indicate their agreement with various statements on a scale from 0 to 4. The measure has demonstrated reliability and validity as a psychometric tool.¹³ For the current study, parents were asked to respond to measure items based on how they typically feel, not specific to COVID-19 or the COVID-19 pandemic.

Parental Health-Status was assessed by using the 36-Item Short Form Health Survey (SF-36). The SF-36 is a self-report health-related quality of life survey that assesses physical function, general health perceptions, vitality, bodily pain, emotional health, social function and mental health.¹⁴

Child Sensitivity to Anxiety was measured with the Childhood Anxiety Sensitivity Index (CASI-R). This is a previously validated 31-item measure designed to assess sensitivity to anxiety in youth ≥ 8 years of age based on self-reported data. Each item is scored on a three-point Likert-type scale ranging from 0 (*not true*) to 2 (*very true*).¹⁵

Outcome

Maladaptive Behaviour in Children was assessed using the parent proxy-report Post-Hospitalisation Behaviour Questionnaire (PHBQ). This widely used 27-item measure assesses new onset behavioural changes across six subscales: general anxiety and regression, separation anxiety, eating disturbance, aggression toward authority, apathy/withdrawal and anxiety about sleep.¹⁶ Originally developed to assess maladaptive behaviours in children after ambulatory surgery, the PHBQ was used in the current study to assess the incidence of new onset of maladaptive behaviours since the child had been informed of the pandemic. The instrument has demonstrated excellent reliability and validity in paediatric samples.¹⁷

Procedures

Parents and children were approached about the possibility of participating in the study by a trained research associate after triage. Participant dyads provided consent, and children provided assent when indicated. Children ≥ 8 years of age completed the self-report anxiety questionnaire, and parents completed the demographic and parent-report questionnaires. Participants completed questionnaires on a tablet via REDCap cloud-based clinical software. The average time to complete all questionnaires was approximately 40 min.

Statistical analysis

Descriptive analyses, including calculations of means, standard deviations and frequencies were conducted on demographic data, potential predictor variables (e.g. parental COVID-19-anxiety, anxiety, and health, and child anxiety) and outcome variables (new-onset maladaptive behaviours). The primary outcome, the PHBQ score, was first scored continuously by summing all items to obtain a total score (Table 1). The PHBQ data were then scored such that all items were coded as 0 (reflecting no behaviour change) or 1 (behaviour occurred more frequently than it had during the preceding week), which is an accepted scoring method for this measure.¹⁸ The continuous score was used to provide descriptive data on the patient population (Table 1). We performed categorical recoding of the PHBQ to examine factors

Table 1 Demographic and baseline characteristics of the study participants

Children	(N = 351)
Age in years (M ± SD)	7.04 ± 5.92
Sex (n (% male))	182 (50.0)
CASI-R total score (M ± SD)	45.94 ± 16.42
Cardiovascular symptoms	13.69 ± 5.95
Publicly observable signs	13.67 ± 4.18
Cognitive dyscontrol	7.55 ± 3.95
Respiratory symptoms	11.38 ± 4.96
PHBQ total score (M ± SD)	74.41 ± 15.53
General anxiety	21.51 ± 5.29
Separation anxiety	13.96 ± 3.40
Eating difficulties	8.49 ± 2.01
Aggression toward authority	5.66 ± 1.24
Apathy/withdrawal	16.52 ± 3.62
Sleep problems	8.44 ± 2.10
Parents	(N = 335)
Age in years (M ± SD)	34.78 ± 8.21
Race/ethnicity (n(%))	
Black	4 (1.2)
Asian American/Pacific Islander	32 (9.6)
Hispanic/Latino	85 (25.4)
White	202 (60.5)
Other	10 (3.0)
Primary language (n (%) English)	272 (74.7)
ASI-3 total score (M ± SD)	11.88 ± 13.66
SF-36 Health Survey (M ± SD)	
Physical functioning	84.62 ± 23.25
Role-physical	67.10 ± 40.01
Bodily pain	85.29 ± 20.94
General health	67.98 ± 22.03
Vitality	54.87 ± 18.53
Social functioning	51.64 ± 24.27
Role-emotional	68.02 ± 40.67
Mental health	72.43 ± 19.00
COVID-19 anxiety (M ± SD)	35.94 (10.35)

ASI-3, Anxiety Sensitivity Index; CASI-R, Childhood Anxiety Sensitivity Index-Revised; M, mean; PHBQ, Post-Hospitalisation Behaviour Questionnaire; SD, standard deviation; SF-36, MOS Short-Form 36 Health Survey.

associated with onset of maladaptive behaviours during the exposure period. The subscale frequencies presented in Figure 1 are based on the recoded data.

The total PHBQ score (continuous) was used to stratify high and low risk groups for subsequent predictor analysis. Participants in the study were stratified into groups with high vs. low risk for maladaptive behaviours by comparing children with total PHBQ scores in the upper quartile (high risk) to those with scores in the lower quartile (low risk). The two groups were then compared using independent-samples *t*-tests and chi-square analyses as appropriate to identify significant group differences in demographic and baseline data (including child and parent age, gender, race/ethnicity, language), and child anxiety sensitivity (CASI-R score), parent state anxiety (VAS score), parent anxiety sensitivity (ASI-3 score), parent health (SF-36 score) and COVID-19 anxiety. Finally, significant factors associated with maladaptive behaviours in *t*-test and chi-square analyses were

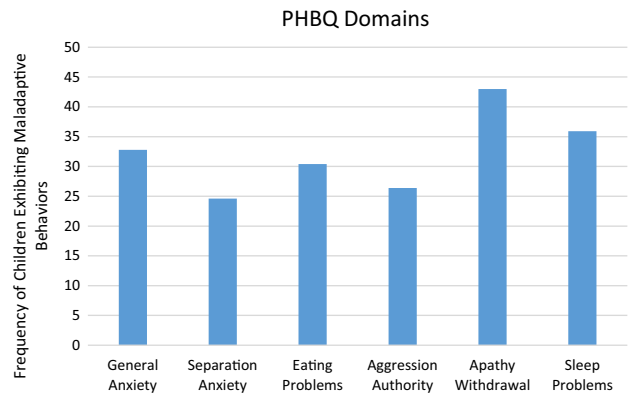


Fig. 1 Frequency of new-onset maladaptive behaviours exhibited by children (general anxiety (n = 107, 32.8%); separation anxiety (n = 82, 24.6%); issues with eating (n = 101, 30.4%); aggression toward authority (n = 88, 26.4%); apathy/withdrawal (n = 141, 43.0%); issues with sleep (n = 119, 35.9%).

included in a binary logistic regression model to investigate factors associated with maladaptive behaviours.

Results

Participant demographics

Baseline data are presented in Table 1. Among the children included in the study (n = 351), mean child age was 7.04 ± 5.92 years, and age and sex were equally distributed. Among the parents included in the study (n = 335), mean age was 34.78 ± 8.21 years. The parents included in the study were primarily non-Hispanic white (n = 202; 60.5%) and spoke English as a primary language (n = 272; 74.7%).

Measurements of general and mental health in parents and children

The frequencies of maladaptive behaviours in each of the domains of the PHBQ are presented in Figure 1. Fifty-six percent (n = 187) of parents rated their health as “about the same” as 1 year before the study period, and 9 % (n = 31) indicated their health was either “somewhat” or “much” worse than 1 year prior. Child and parent general and mental health descriptive data are displayed in Table 1.

New-onset maladaptive behaviour: Bivariate analysis

Bivariate analysis was performed to identify factors associated with increased risk for maladaptive behaviours in children during the COVID-19 pandemic (Table 2). The results of the independent samples *t*-test showed that sensitivity to anxiety in parents, as measured with the ASI-3, and state anxiety in parents, as measured with the VAS-A, were significantly associated with increased risk for maladaptive behaviour in children during the COVID-19 pandemic ((*t*(243) = -3.19 (P = 0.002) and *t*

Table 2 Predictors of new-onset maladaptive behaviours on the PHBQ

	Lower quartile PHBQ score (n = 153)	Upper quartile PHBQ score (n = 109)	P-value
<i>Child factors</i>			
Age in years (M ± SD)	6.77 ± 6.05	7.91 ± 5.85	0.132
Race/ethnicity (n(%))	92 (64%)	73 (69%)	0.332
Sex (n(%)) male	67 (47%)	52 (49%)	0.731
Anxiety sensitivity (CASI-R; M ± SD)	43.09 ± 18.32	49.86 ± 14.56	0.044*
<i>Parent factors</i>			
Mother's age in years (M ± SD)	34.61 ± 8.23	35.69 ± 7.75	0.511
Father's age in years (M ± SD)	37.49 ± 8.73	38.23 ± 8.73	0.295
Sex (n(%)) mothers	118 (83%)	95 (90%)	0.115
State anxiety (VAS-A; M ± SD)	31.88 ± 28.57	52.72 ± 29.11	<0.001*
Anxiety sensitivity (ASI-3; M ± SD)	9.48 ± 12.68	15.07 ± 14.51	0.002*
Physical function (M ± SD)	87.32 ± 21.89	79.63 ± 25.17	0.009*
Role limitations due to physical function (M ± SD)	71.38 ± 37.45	55.24 ± 42.98	0.002*
Role limitations due to emotional function (M ± SD)	73.11 ± 39.14	56.41 ± 42.84	0.001*
Energy/fatigue (M ± SD)	58.01 ± 16.81	49.51 ± 20.06	<0.001*
Mental health (M ± SD)	78.46 ± 15.81	63.69 ± 21.05	<0.001*
Social function (M ± SD)	53.58 ± 22.87	48.08 ± 26.97	0.795
Pain (M ± SD)	86.62 ± 19.06	81.49 ± 23.63	0.057
General health (M ± SD)	73.31 ± 18.64	61.33 ± 22.66	0.010*
COVID-19 anxiety (M ± SD)	33.81 ± 11.06	39.01 ± 9.10	<0.001*

*Statistically significant difference according to the independent samples *t*-test. ASI-3, Anxiety Sensitivity Index; CASI-R, Childhood Anxiety Sensitivity Index-Revised; M, mean; PHBQ, Post-Hospitalisation Behaviour Questionnaire; SD, standard deviation; VAS-A, Visual Analog Scale (0–100).

(190) = -4.91 ($P < 0.001$), respectively). The measures of parent health-related functioning associated with increased risk for maladaptive behaviour in children were physical function ($t(259) = 2.63$ ($P = 0.009$)), role limitations due to physical function ($t(255) = 3.20$ ($P = 0.002$)), role limitations due to emotional function ($t(252) = 3.22$ ($P = 0.001$)), energy/fatigue ($t(249) = 3.63$ ($P < 0.001$)), mental health ($t(249) = 6.35$ ($P < 0.001$)) and general health ($t(258) = 4.67$ ($P < 0.001$)). Lastly, higher levels of COVID-19 anxiety in parents were associated with higher levels of new-onset maladaptive behaviour in children ($t(244) = -3.93$ ($P < 0.001$)). Anxiety sensitivity in children, as measured with the CASI-R, was also significantly associated with maladaptive behaviours ($t(96) = -2.04$ ($p = 0.044$)).

New-onset maladaptive behaviour: Logistic regression analysis

Factors found to be associated with maladaptive behaviours in independent samples *t*-test and chi-square analyses were entered into a binary logistic regression model. Given issues with collinearity, the ASI-3 was included, but VAS-A was excluded. Given issues of collinearity among the subscales of the SF-36, only the following SF-36 subscales were entered into the regression model: physical functioning, role limitations due to physical functioning, role limitations due to emotional functioning and mental health.¹⁹ Parent self-reported COVID-19 anxiety was entered as the final variable, with child self-reported anxiety excluded due to high overlap with the PHBQ items investigating anxiety. The logistic model identified parent mental health and COVID-19 anxiety as factors with significant associations with maladaptive behaviours ($X^2(6) = 42.514$, $P < 0.001$) (see Table 3). Specifically,

every unit change in parental anxiety of COVID-19 was associated with a unit increase in maladaptive behaviours in children.

Discussion

The results of this study showed that nearly 40% of children presenting to the ED exhibited new onset negative behaviours during the study period, which coincided with mandatory stay-at-home guidelines. The levels of new onset maladaptive behaviours reported by parents were similar to levels observed in children recovering from surgery.²⁰ Consistent with prior research of psychological changes after surgery, apathy was the most common maladaptive behaviour exhibited by children in this study.²¹ A logistic regression model identified that parent mental health and COVID-19 anxiety predicted new onset maladaptive behaviours.

One unique finding of this study is the significant positive association between COVID-19 anxiety in parents and maladaptive behaviours in children during the implementation of stay-at-home guidelines, which began on 19 March 2020. This association may reflect the transference of stress from parents to children. Child anxiety sensitivity scores suggested that children in our sample were experiencing elevated levels of anxiety during the pandemic, compared to mean levels in a similar paediatric clinical sample assessed prior to the COVID-19 pandemic. Previous studies of the psychological predictors of anxiety surrounding other disease outbreaks (e.g. H1N1, Ebola) in college students showed that health anxiety was a significant predictor of swine flu-related anxiety and that physical concerns related to sensitivity to anxiety predicted fear of Ebola.^{11,22} In one study, children's fear of the swine flu was significantly related to parents' fear of the disease.²³ However, these studies did not examine the association

Table 3 Results of logistic regression analysis for the association between scores on various subdomains of the PHBQ and new-onset maladaptive behaviours during the implementation of stay-at-home guidelines for management of the COVID-19 pandemic

Variable	β (SE)	Odds ratio (CI)	P-value
Anxiety Sensitivity Index (ASI-3)	0.04 (0.01)	1.00 (0.98–1.03)	0.766
Physical function	−0.01 (0.01)	0.99 (0.98–1.01)	0.224
Role limitations due to physical function	0.00 (0.01)	1.00 (0.99–1.01)	0.986
Role limitations due to emotional function	−0.01 (0.01)	1.00 (0.99–1.01)	0.739
Mental health	−0.04 (0.01)	0.97 (0.95–0.98)	<0.001**
COVID-19–anxiety	0.42 (0.02)	1.04 (1.01–1.08)	0.006**

** $P < 0.01$. ASI-3, Anxiety Sensitivity Index; PHBQ, Post-Hospitalisation Behaviour Questionnaire.

between pandemic fear and new-onset maladaptive behaviours. One recent study investigated behavioural changes during the COVID-19 pandemic in healthy children 3–18 years of age living in China. The authors found clinging, inattention and irritability in >30% of the study population.⁵ Another study of school-age children previously diagnosed with attention-deficit hyperactivity disorder demonstrated a significant worsening of attention-deficit hyperactivity disorder behaviours during the COVID-19 pandemic.²⁴ Our PED study sample represents a population that may especially benefit from screening for new-onset maladaptive behaviours during the COVID-19 pandemic as parents and children presenting to the PED may be experiencing additional distress related to their need for urgent medical care. Child anxiety sensitivity scores suggested that children in our sample were experiencing elevated levels of anxiety during the pandemic, compared to mean levels in a similar paediatric clinical sample assessed prior to the COVID-19 pandemic.²⁵ Interventions designed to reduce COVID-19 anxiety in parents may affect maladaptive behaviour in children, but it is unclear if such interventions would impact baseline parental or child anxiety that is not related to the pandemic.

In this study, parent state anxiety and anxiety sensitivity, as well as anxiety sensitivity in children, were associated with increased risk for maladaptive behaviours. Previous work has shown that stressful health-related events, such as a child needing surgery, can result in new maladaptive behaviours and that preoperative parent and child anxiety are associated with an increase in risk for maladaptive behaviours after surgery.^{8,9} In addition, a recent study conducted in Italy demonstrated that a parent's perception of the difficulty of quarantine was significantly associated with parental stress levels, as well as the incidence of psychological issues in children.²⁶ Our current study suggests that baseline anxiety in parents as well as children may be associated with maladaptive behaviours in children during the stressful event of mandatory quarantine for a pandemic. Efforts to target anxiety may be useful in reducing the incidence of these negative behaviours. Interviews that include questions to the parent about whether the child or parent has been diagnosed with anxiety might be helpful to clinicians in efforts to screen for children likely to exhibit negative behaviours during the implementation of stay-at-home guidelines.

The novel finding of this cross-sectional study is the powerful association between various measures of psychological health in parents and increased risk for maladaptive behaviours in children during the implementation of stay-at-home guidelines during the COVID-19 pandemic. Strong associations were found between

maladaptive behaviours in children and the following parental factors: state anxiety (as measured with the VAS-A), anxiety sensitivity (as measured with the ASI-3), physical function, role limitations due to physical function, role limitations due to emotion function, energy/fatigue, general health, COVID-19 anxiety and mental health. Notably, every unit change in parental mental health was associated with a unit increase in risk for new-onset maladaptive behaviours. This finding could guide screening in a PED to improve accuracy in identifying parents who would benefit from consultation with a social worker or referral to additional resources.

Limitations

There are several limitations to this study. This was a cross-sectional study that did not include a control group for comparison. Additional research will be necessary to determine whether the incidence of maladaptive behaviours observed in this population of PED patients was elevated over and above what would generally be expected in an ED. Furthermore, our finding of a potential association between anxiety sensitivity in the child and maladaptive behaviours during the pandemic could not be added to the regression model due to collinearity issues. Of note, approximately 34% of the children included in the study were being seen for symptoms suggestive of COVID-19, and 9.5% were ultimately tested for COVID-19. Data from these two population subgroups were not evaluated separately for comparison with children and families being seen for other reasons. Such a comparison would allow for better examination of COVID-19 anxiety in families where the illness was actually suspected.

Due to the cross-sectional design of the study, it is not possible to draw conclusions on cause-effect relationships. Another limitation is that the population was a convenience sample over a 1-month period, and some parents and children who were approached to participate in this study elected not to do so. It is important to note that one common reason for non-participation was extreme parent or child anxiety. This may have biased the study toward a less anxious population; however, parent anxiety sensitivity levels were comparable to non-clinical norms¹³ and child anxiety was higher than a pre-COVID-19 paediatric sample.²⁵ Furthermore, the selection of subjects in the ED is an obvious confound because ED visits are stressful in and of themselves; associated stress was further compounded by concerns related to virus exposure in waiting rooms and hospitals. These factors may limit the generalizability of the results.

However, the patients included in this study exhibited a broad spectrum of clinical conditions and are therefore likely to represent other PED populations.

Conclusion

In this study, parent reports were used to identify maladaptive behaviours in paediatric patients presenting to our PED during the COVID-19 pandemic. Increased risk for maladaptive behaviours was associated with higher levels of parental anxiety and COVID-19 anxiety. Recognition of these effects and potential contributing factors by healthcare providers is necessary to obtain the resources parents and their children need to protect their psychological health. Understanding the psychological factors that predict anxiety and maladaptive behaviours in the context of a disease outbreak is vital, as it may inform the treatment and prevention of health-related anxiety.²⁷ Additional studies are needed to identify treatable subcomponents of stress and specific populations most likely to benefit from counselling. The data obtained may accelerate the rate at which ED staff can identify high-risk situations. Future research should also be targeted toward elucidating appropriate interventions for parents and their children to ameliorate maladaptive behaviours. ED-specific interventions to reduce stress, such as counselling, social worker consultation and passive resource allocation should be considered.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Table S1 Chief complaint of emergency department patients seen during the study period ($N = 3081$)