

# BMJ Open Quality Practical resiliency training for healthcare workers during COVID-19: results from a randomised controlled trial testing the Community Resiliency Model for well-being support

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**To cite:** Duva IM, Higgins MK, Baird M, *et al.* Practical resiliency training for healthcare workers during COVID-19: results from a randomised controlled trial testing the Community Resiliency Model for well-being support. *BMJ Open Quality* 2022;**11**:e002011. doi:10.1136/bmjog-2022-002011

► Additional supplemental material is published online only. To view, please visit the journal online (<http://dx.doi.org/10.1136/bmjog-2022-002011>).

Received 7 June 2022  
Accepted 1 November 2022



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## ABSTRACT

**Objective** To introduce the Community Resiliency Model (CRM) as mental well-being support for healthcare workers working through the height of the COVID-19 pandemic.

**Design** Randomised controlled trial with a no treatment control group.

**Setting** Two large urban health systems in the Southern United States between October 2020 and June 2021.

**Participants** Eligible participants were currently employed as healthcare workers within the participating healthcare systems. 275 employees registered and consented electronically in response to email invitations. 253 participants completed the baseline survey necessary to be randomised and included in analyses.

**Intervention** Participants were assigned 1:1 to the control or intervention group at the time of registration. Intervention participants were then invited to 1-hour virtual CRM class teaching skills to increase somatic awareness in the context of self and other care.

**Main outcome measures** Self-reported data were collected rating somatic awareness, well-being, symptoms of stress, work engagement and interprofessional teamwork.

**Results** Baseline data on the total sample of 275 (53% nurses) revealed higher symptoms of stress and lower well-being than the general population. The intervention participants who attended a CRM class (56) provided follow-up survey data at 1 week (44) and 3 months (36). Significant improvement for the intervention group at 3 months was reported for the well-being measures (WHO-5,  $p < 0.0087$ ,  $d = 0.66$ ; Warwick-Edinburgh Mental Well-Being Scale,  $p < 0.0004$ ,  $d = 0.66$ ), teamwork measure ( $p \leq 0.0002$ ,  $d = 0.41$ ) and stress (Secondary Traumatic Stress Scale,  $p = 0.0058$ ,  $d = 46$ ).

**Conclusion** Baseline results indicate mental health is a concern for healthcare workers. Post intervention findings suggest that CRM is a practical approach to support well-being for healthcare workers during a crisis such as this pandemic. The simple tools that comprise the model can serve as a starting point for or complement self-care strategies to enhance individual resilience and buffer the effects of working in an increasingly stressful work environment.

## WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Little is known about how to support healthcare workers during a pandemic. Prior to COVID-19, a need for more studies on front-line healthcare workers during disease outbreaks and higher quality evidence for interventions to build resilience and mental health was identified. One prepandemic study tested a Community Resiliency Model training for a group of nurses with promising results; the nurses showed significant improvement in several well-being measures compared with nurses who were randomly assigned to a nutrition training.

## WHAT THIS STUDY ADDS

⇒ This randomised controlled trial measures the effect of an intervention on front-line healthcare workers during a pandemic. The findings from this study contribute to a growing evidence base demonstrating the Community Resiliency Model is an effective self-care strategy for healthcare workers.

## HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Resilience and mental health needs for healthcare workers will not be short term. The Community Resiliency Model offers a set of accessible and easy-to-learn skills for individuals to use in the face of adversity. This intervention can be part of a larger organisational strategy to support employee well-being and protect staff from burn-out during COVID-19 and beyond.

## INTRODUCTION

Attention to stressful working conditions in healthcare predates the current SARS-CoV-2 (COVID-19) pandemic. In Fall 2019, a National Academies Press report recommended a systems approach to address the controllable factors relating to job demands and job resources to reduce clinician burn-out, which is known to interfere with patient-centred and high-quality care.<sup>1</sup> As



the pandemic conditions persist, concern for burn-out among healthcare workers (HCW) has been complicated by unprecedented, complex patient care and heavier workloads due to the resource constraints of staffing shortages, training needs and supply chain problems. The emotional toll of the pandemic on HCWs is already documented; mental health sequelae include depression, anxiety, post-traumatic stress disorder (PTSD) and decreased well-being overall.<sup>2-8</sup> Impaired mental well-being, loss of job satisfaction, burn-out and the intent to leave one's position are all associated and these are costly consequences that affect the ability to deliver safe, quality patient care.<sup>9-13</sup> One COVID-era study identified a worrisome 50% career change ideation in a sample of over 1000 HCWs<sup>14</sup> and Elsevier's Clinician of the Future Report estimates a mass exodus: 75% of HCWs will leave their jobs by 2025.<sup>15</sup>

Despite the negative effects of workplace pressure both personally and professionally, little evidence exists to guide support for individual HCW mental health and resiliency. Prior to COVID-19, supportive interventions during disease outbreaks and epidemics were reviewed and found to be understudied and inconclusive.<sup>16</sup> The 2019 'System's Model of Clinician Burnout and Professional Well-Being' posits that individual characteristics mediate the effect of a stressful work environment.<sup>1</sup> Thus, investing in interventions to support HCW resilience at the individual level is warranted.

The Community Resiliency Model (CRM) is a promising, research-informed intervention for front-line, public safety and essential workers.<sup>17 18</sup> Prior to the pandemic, the model was tested using a randomised controlled design against a nutrition intervention with 77 nurses at a large urban hospital. After exposure to a 3-hour CRM training, moderate to large effect sizes were demonstrated for improved well-being, resiliency, secondary traumatic stress (STS) and somatic symptoms (SS).<sup>19</sup> Nurses in the study who were taught CRM reported using their new skills on the job to reduce stress, and during 'scary situations with patients' or 'after a traumatic or distressing experience'. CRM is a novel approach to mental wellness self-care. The six easy-to-learn skills bring attention to body sensations in the present moment, which interrupts autonomic responses to stress.<sup>17</sup> CRM's cultivation of body awareness as a means of developing resilience and coping is supported by neuroscience and a burgeoning evidence base.<sup>20-22</sup>

The biological perspective of CRM frames human reactions to stress as normal, helping to destigmatise mental health and behavioural reactions. Individuals can use CRM skills to cope with troubling emotions (eg, frustration, anxiety, anger) by paying attention to external or internal sensations (respectively exteroception and interoception) in their own body; intentional interoceptive awareness is a physical mindfulness, devoid of emotional or cognitive content. For example, when faced with a challenging or anxiety-producing situation at work, an HCW can intentionally touch and notice sensations of

the fabric of their uniform, inducing a momentary pause which may deter negative emotional responses. Dysregulated emotions in the workplace interfere with interpersonal relations and rational decision-making. Conversely, practising CRM skills fosters a prosocial mindset and increases one's capacity to manage stress in the moment. The skills are reciprocal providing an exponential benefit at the community level, in this case with coworkers or patients, upholding the delivery of safer quality care.

### Purpose

The purpose of this study was to test the effect of a brief, virtual CRM training to support HCW well-being, work engagement and interprofessional teamwork while reducing secondary stress symptoms during the heightened stress of the pandemic. In the present study, HCW includes front-line clinicians and any staff member supporting the work of care providers within a large, urban healthcare setting.

### Specific aims

To compare self-reported responses at 1 week and 3 months after a single 1-hour virtual CRM training to a no-treatment group. Measures included:

- ▶ Sense of well-being, resiliency and sensory awareness.
- ▶ Perceptions of work engagement and interprofessional teamwork.
- ▶ SS and STS.

### METHODS

The study population included staff (HCWs) from two large, urban healthcare settings (see [table 1](#)). The only eligibility requirement was employment at either healthcare system during the time of the study. A convenience sample of 253 volunteers were recruited from 1000 invitees directly by key contacts using intranet email within the health systems. Participants consented after accessing the registration link at the time of study enrolment. As registration was accepted random assignment to the intervention or no intervention control group occurred using Research Electronic Data Capture (REDCap) (see [figure 1](#)). The 128 participants randomised to the intervention group were emailed an invitation to attend one of several scheduled 1-hour introductory classes. Fifty-six intervention participants attended a class, taught virtually via the Zoom platform. CRM teachers, all certified by the Trauma Resource Institute in Claremont, California, taught the model and engaged participants through the Zoom chat feature and a synchronous postclass question and answer period. During the class, participants were invited to download an app, 'ichill', for skill reinforcement. Data were collected from participants at three time points: consent, 1 week and 3 months post-training (or after baseline survey if in the control group). Control participants were offered the CRM training when their 3-month survey was completed. Twenty of these participants attended a class but were not included in the study analyses.

**Table 1** Demographics and clinical risk characteristics

	Control (n=127)	Intervention (n=126)	Total (n=253)
<b>Demographics</b>			
Age			
Mean (SD)	43.906 (12.358)	43.944 (12.265)	43.925 (12.287)
Range	23.000–71.000	24.000–70.000	23.000–71.000
Years worked in healthcare			
Median (Q1, Q3)	15.000 (6.500, 27.000)	15.000 (7.000, 27.750)	15.000 (7.000, 27.000)
Range	0.000–48.000	0.000–47.000	0.000–48.000
Years in current position			
Median (Q1, Q3)	3.000 (1.750, 7.000)	3.250 (2.000, 8.000)	3.000 (2.000, 7.000)
Range	0.000–38.000	0.000–35.000	0.000–38.000
Gender (%)			
Male/choose not to answer	15 (11.8)	24 (19.0)	39 (15.4)
Female	112 (88.2)	102 (81.0)	214 (84.6)
Type of work (%)			
Outpatient primary care	10 (7.9)	9 (7.1)	19 (7.5)
Outpatient specialty care	20 (15.7)	17 (13.5)	37 (14.6)
Inpatient care	52 (40.9)	50 (39.7)	102 (40.3)
ED	5 (3.9)	13 (10.3)	18 (7.1)
Support services	12 (9.4)	11 (8.7)	23 (9.1)
Administration	15 (11.8)	15 (11.9)	30 (11.9)
Other	13 (10.2)	11 (8.7)	24 (9.5)
Role at work ( <i>not mutually exclusive</i> ) (%)			
Nursing	52 (40.9)	49 (38.9)	101 (39.9)
Administration	15 (11.8)	15 (11.9)	30 (11.9)
Physician	13 (10.2)	13 (10.3)	26 (10.3)
Support services	14 (11.0)	11 (8.7)	25 (9.9)
APRN/PA	11 (8.7)	12 (9.5)	23 (9.1)
Pharmacy	6 (4.7)	8 (6.3)	14 (5.5)
Social services	4 (3.1)	4 (3.2)	8 (3.2)
Technician	3 (2.4)	3 (2.4)	6 (2.4)
Therapists	4 (3.1)	2 (1.6)	6 (2.4)
Rehabilitation	1 (0.8)	1 (0.8)	2 (0.8)
Other	17 (13.4)	15 (11.9)	32 (12.6)
<b>Clinical risk factors</b>			
Significant stressors ( <i>not mutually exclusive</i> ) (%)			
Work	103 (81.1)	98 (77.8)	201 (79.4)
COVID-19 challenges	86 (67.7)	80 (63.5)	166 (65.6)
Emotional	66 (52.0)	69 (54.8)	135 (53.4)
Family	64 (50.4)	63 (50.0)	127 (50.2)
Financial	31 (24.4)	28 (22.2)	59 (23.3)
Illness	18 (14.2)	26 (20.6)	44 (17.4)
Other	9 (7.1)	9 (7.1)	18 (7.1)
WHO<50: poor well-being (%)			

Continued

**Table 1** Continued

	Control (n=127)	Intervention (n=126)	Total (n=253)
WHO $\geq$ 50	64 (50.4)	57 (45.2)	121 (47.8)
WHO<50	63 (49.6)	69 (54.8)	132 (52.2)
WHO<29: risk of clinical depression (%)			
WHO $\geq$ 29	106 (83.5)	99 (78.6)	205 (81.0)
WHO<29	21 (16.5)	27 (21.4)	48 (19.0)
SSS-8: somatic symptoms (%)			
N-Miss	8	10	18
<4, none to minimal	15 (12.6)	16 (13.8)	31 (13.2)
4 to <8, low	27 (22.7)	26 (22.4)	53 (22.6)
8 to <12, medium	24 (20.2)	25 (21.6)	49 (20.9)
12 to <16, high	25 (21.0)	22 (19.0)	47 (20.0)
$\geq$ 16, very high	28 (23.5)	27 (23.3)	55 (23.4)
STSS-DSM-5: five categories (%)			
N-Miss	21	21	42
<26, little to none	10 (9.4)	2 (1.9)	12 (5.7)
26–33, mild	12 (11.3)	13 (12.4)	25 (11.8)
34–41, moderate	18 (17.0)	26 (24.8)	44 (20.9)
42–45, high	13 (12.3)	19 (18.1)	32 (15.2)
$\geq$ 46, severe	53 (50.0)	45 (42.9)	98 (46.4)
At risk for PTSD (from STSS-5 criteria) (%)			
N-Miss	8	8	16
No	82 (68.9)	76 (64.4)	158 (66.7)
Yes	37 (31.1)	42 (35.6)	79 (33.3)

APRN/PA, advanced practice registered nurse/physician assistant; DSM-5, Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition; ED, emergency department; PTSD, post-traumatic stress disorder; SSS-8, Somatic Symptom Scale-8; STSS, Secondary Traumatic Stress Scale.

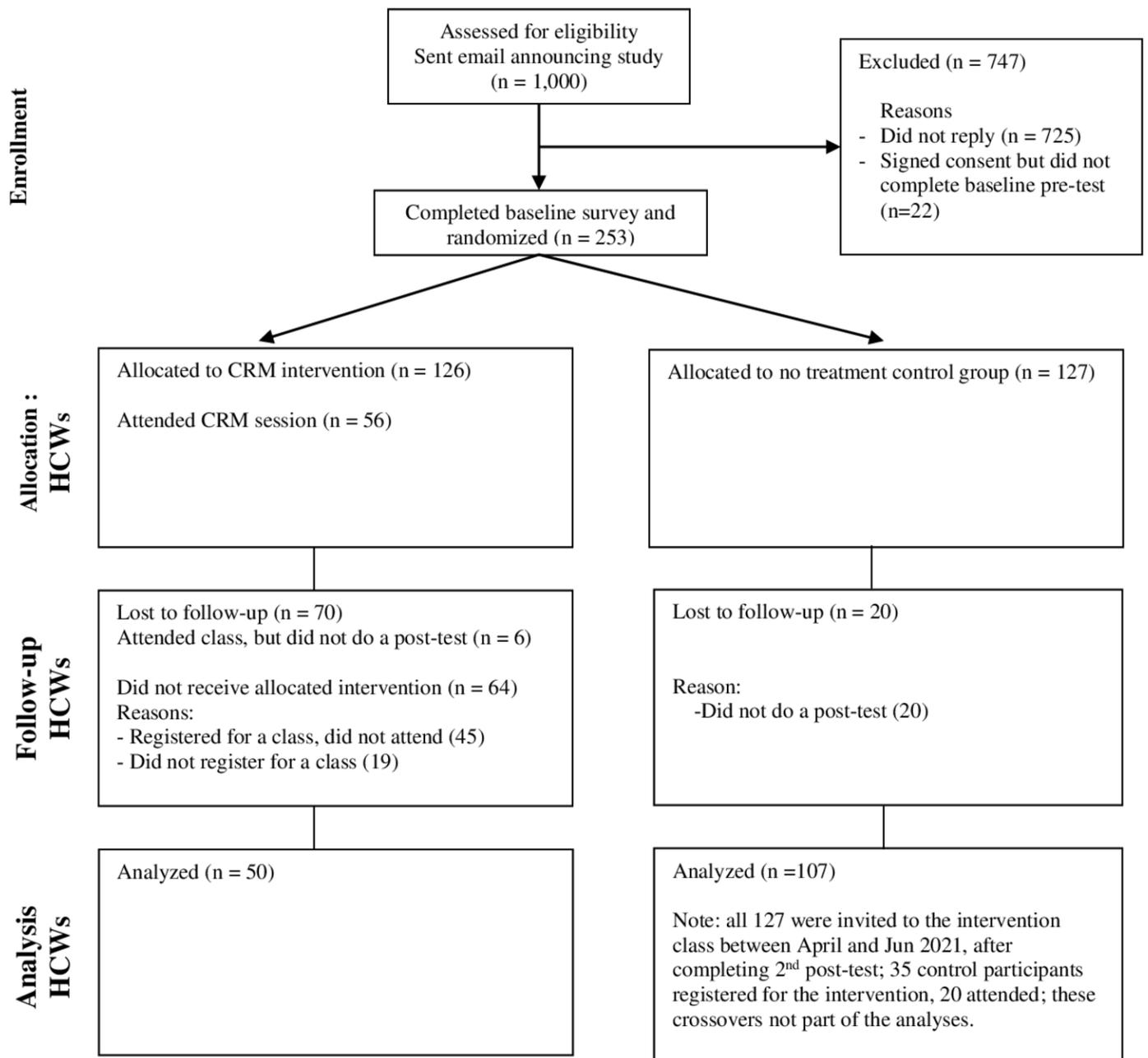
### Patient and public involvement

Patients were not involved in this study. The participants in this study were front-line HCWs, and HCWs were involved in all aspects of this study. The research question was prompted by early concerns for HCW well-being due to the increased workload, resource limitations and fear of exposure or spread of COVID-19. The study team was comprised of CRM-certified HCWs who were aware that there was limited evidence guiding how to support HCWs during a pandemic, but that CRM had shown promise when tested with HCWs in non-pandemic conditions. The outcome measures were also informed by HCWs representing the participants. Two members of the research team were employed by the participating organisation: one a provider and one a nurse (MB and DL). The Utrecht Work Engagement Scale (UWES) was the measure of choice to evaluate burn-out due to its organisational relevance. A team relations measure was developed to evaluate a change in the conditions for interprofessional collaboration, known to support better patient

care and possibly more difficult at this time of increased stress.

The delivery of the intervention was informed by HCW needs. Consideration was made for lower staff morale, the possibility of associated stigma and increased time constraints, all expressed by the participating organisation. A brief, virtual and small group training was provided which allowed participants to interact, ask questions and provide feedback to the study team. Snowball recruitment was encouraged after study registration and control participants were given the opportunity to attend the intervention (training) after study completion (submission of a 3-month survey).

Preliminary findings from this randomised controlled trial were disseminated to the participants and organisation sponsors at the close of the study. These preliminary findings were also shared with the Trauma Resource Institute in California, where CRM was developed, and with the funding entity at the organisation (Woodruff Health Sciences Center). With consideration to the lay



**Figure 1** Consolidated Standards of Reporting Trials (CONSORT) flow diagram for randomised controlled trial of the Community Resiliency Model (CRM) non-pharmacological treatment. HCW, healthcare worker.

public, discussion of the study findings is included as part of a Medscape/WebMD Resiliency webcast, as well as a VoiceAmerica Health and Wellness Channel ‘Resiliency Within’ podcast. The broad reach across audiences promotes an understanding of stress threats to well-being and skills for self-care during COVID-19 and beyond.

### Measures

The pre-post survey included four previously tested and psychometrically sound instruments measuring emotional health, physical health, work engagement and one custom measure of teamwork and collaboration. Data collection began in October 2020 and finished in June 2021. Intervention participants also provided qualitative

feedback describing their use of CRM skills with post-tests (1 week, 3 months). The measures were:

- ▶ The WHO-5 Well-Being Index; 5-item scale 0–5, with higher scores indicating greater well-being; range: 0–25; scores are then multiplied by 4 to rescale the total from 0 to 100. The cut-point of poor mental well-being is <50.<sup>23</sup> The cut-point for possible clinical depression is <29. A pre-COVID study found a risk of clinical depression in 11.3% of nurses in an acute care setting.<sup>19</sup>
- ▶ An additional two items from the validated Warwick-Edinburgh Mental Well-Being Scale (WEMWBS).<sup>24</sup> This was to extend the WHO well-being measure for



- concepts of feeling competent (I've been dealing with problems well) and socially connected (I've been feeling close to other people).
- ▶ The Connor-Davidson Resilience Scale-2 (CD-RISC-2); 2-item scale 0–4, with higher scores indicating greater resilience and stress tolerance; range 0–8.<sup>25 26</sup> These items reflect adaptability or rebound from difficulty (I am able to adapt when changes occur and I tend to bounce back after illness, injury or other hardships).
  - ▶ The Multidimensional Assessment of Interoceptive Awareness-2 (MAIA-2)<sup>27</sup> Noticing subscale; 4-item scale 0–5; range 0–20. A higher score would indicate greater body awareness. Because the crux of CRM is body awareness, the Noticing subscale was of interest. The MAIA-2 has been used to demonstrate the link between interoceptive (body) awareness and mental well-being,<sup>28</sup> and interoceptive awareness has been found to be a key contributor to mental health.<sup>29 30</sup>
  - ▶ Interprofessional Teamwork Measure, a five-question scale based on the Relational Coordination Inventory<sup>31</sup> and the Intensity of Interdisciplinary Collaboration subscale.<sup>32</sup> Five items: 0–5; range 0–25, focusing on the presence of characteristics necessary for interdependent work with those team members not part of the participant's own profession. Higher scores indicate a perception of better interprofessional relations. The association between stress and loss of attentional focus is well known. Stress can cause a shift to a more individualistic perspective, which in a group context has been found to lead to lower team performance.<sup>33</sup> Team performance is critical to collaboration and necessary to provide optimal patient care.<sup>34</sup> Quality healthcare requires team members from all professional backgrounds work together with patients, their families, caregivers and communities to meet patient needs.<sup>35</sup>
  - ▶ Shortened UWES-9, 0–6; range 0–54 (total scale) or 0–18 on subscales (vigour, dedication and absorption) operationalised burn-out by measuring a positive, strength-based alternative to the consequence of occupational stress. Higher scores on the UWES-9 indicate higher work engagement and are negatively correlated with burn-out.<sup>36</sup> Measuring work engagement provides a positive contrast to burn-out, aligning with the strengths-based perspective of CRM and consistent with organisational intent for work to be rewarding and meaningful.<sup>1</sup>
  - ▶ The Somatic Symptom Scale-8 (SSS-8); 8-item scale 0–4; range 0–32. Cut-points indicate none to minimal (0–3), low (4–7), medium (8–11), high (12–15) or very high (16–32) SS burden. The SSS-8 is a short version of the Patient Health Questionnaire-15, reflecting physical symptom burden, and consisting of a general factor as well as gastrointestinal symptoms, pain, cardiopulmonary symptoms and fatigue. SS are often a reflection of stressful and traumatic

experiences<sup>37</sup> and these physical complaints are associated with mental conditions such as depression and anxiety.<sup>38 39</sup>

- ▶ The Secondary Traumatic Stress Scale (STSS); 21-item scale of frequency of stress symptoms 1–5, with higher scores indicating greater frequency; range of total STSS 21–105, a higher total score indicating more secondary trauma symptoms.<sup>40</sup> Per email communication with the STSS developer, Dr Brian Bride: STSS>43 is high to severe; moderate STSS is 34–42. It is also possible to identify participants who are likely to have PTSD, with the following Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition criteria: one Intrusion item, one Avoidance item, two Negative Cognitions and Mood items and two Arousal and Reactivity items. Note may be made of the relationship between STS and burn-out. Previous research with helping professionals has suggested that burn-out precedes STS.<sup>9</sup>

Participants entered data directly into REDCap, a secure, internally hosted, web-based application designed to support data capture for clinical and translational research databases.<sup>41</sup> Only the two principal investigators, REDCap manager and statistician had access to the data. Descriptive statistics were computed for all demographics and instrument scores at each time point (baseline, 1 week and 3 months). Internal consistency reliability was assessed for each instrument by computing Cronbach's alpha for complete item responses at baseline. Multilevel linear models (MLM) were used to model the repeated longitudinal measures, adjust for missing data due to attrition over time and compare changes over time between the two groups. Post hoc tests were also performed using Sidak pairwise error rate adjustment for the multiple comparisons between time points between groups.<sup>42</sup>

All p values for statistical tests and models are reported, as well as effect sizes for clinically meaningful differences. F statistical models and tests with reported p values and effect sizes (Cohen's d) were computed based on the change scores from baseline to each follow-up time point<sup>43</sup> to evaluate small (d=0.2), moderate (d=0.5) and large (d=0.8) effect sizes to identify meaningful changes.<sup>44</sup> All computations were performed using IBM SPSS Statistics for Windows V.27.0<sup>45</sup> and R V.4.1.0.<sup>46</sup>

## RESULTS

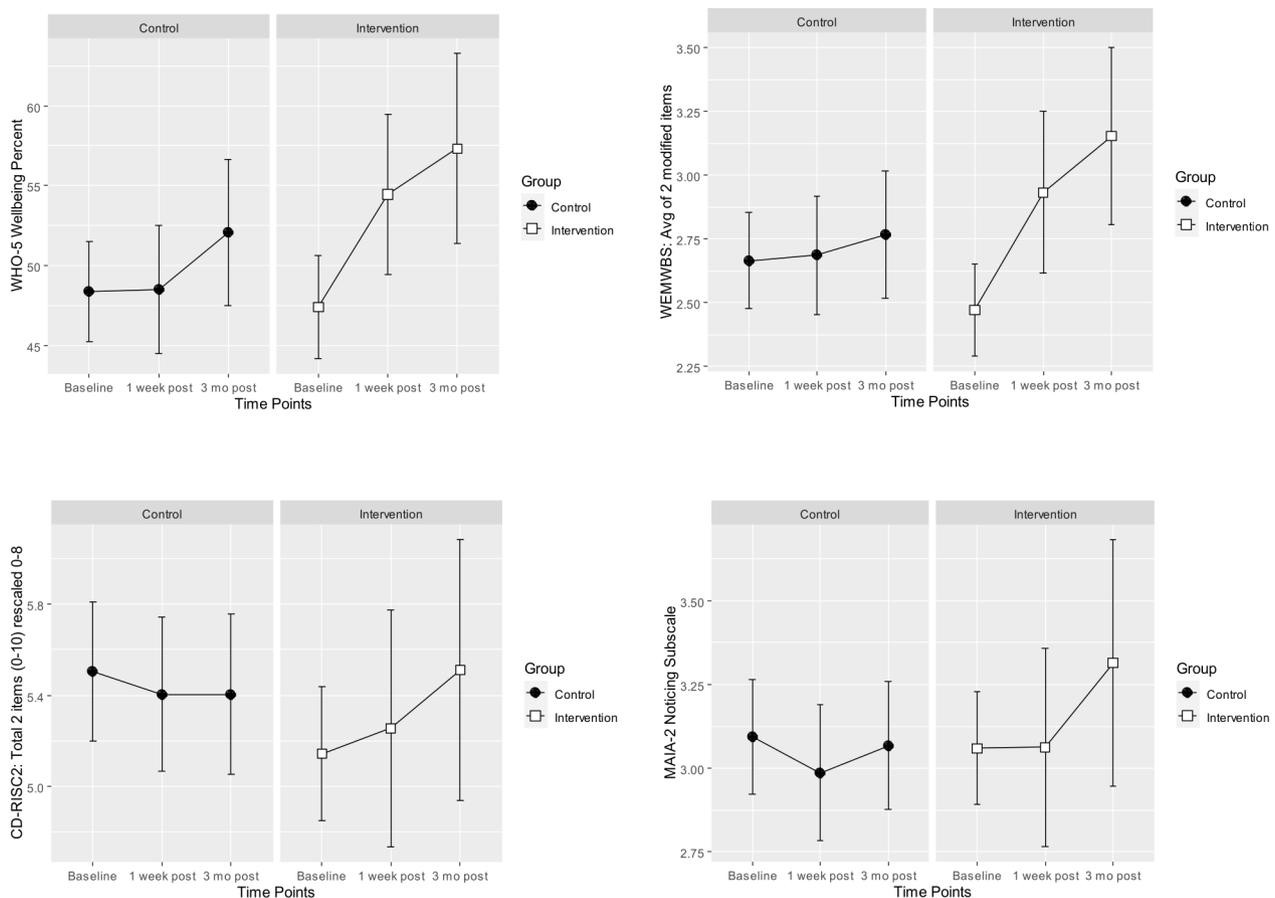
A total of 253 HCWs were enrolled in the study (see [table 1](#)). The intervention and control groups were statistically similar. The ages of the participants ranged from 23 to 71, average 44 years old (SD 12.4); years worked in healthcare ranged from 0 to 48 with a median of 15 years, and years in current position ranged from 0 to 38 with a median of 3 years. The majority were female (84.6%) and the main type of work was inpatient care (40.3%), followed by outpatient specialty care (14.6%) and administration (11.9%). Nursing (39.9%) was most often reported as the primary role at work (non-mutually exclusive options; ie,

participants could select more than one role), followed by administration, physicians and support services roles. It is noteworthy that at baseline more than half (52.2%) of the participants had poor well-being scores (WHO-5 scores <50) with approximately one-fifth (19.0%) at risk for clinical depression (WHO-5 scores <29). Additionally, 43.4% had high to very high SS burden (SS scores  $\geq 12$ ) and most of the subjects had moderate to severe stress symptoms (82.5%, STSS-5  $\geq 34$ ).

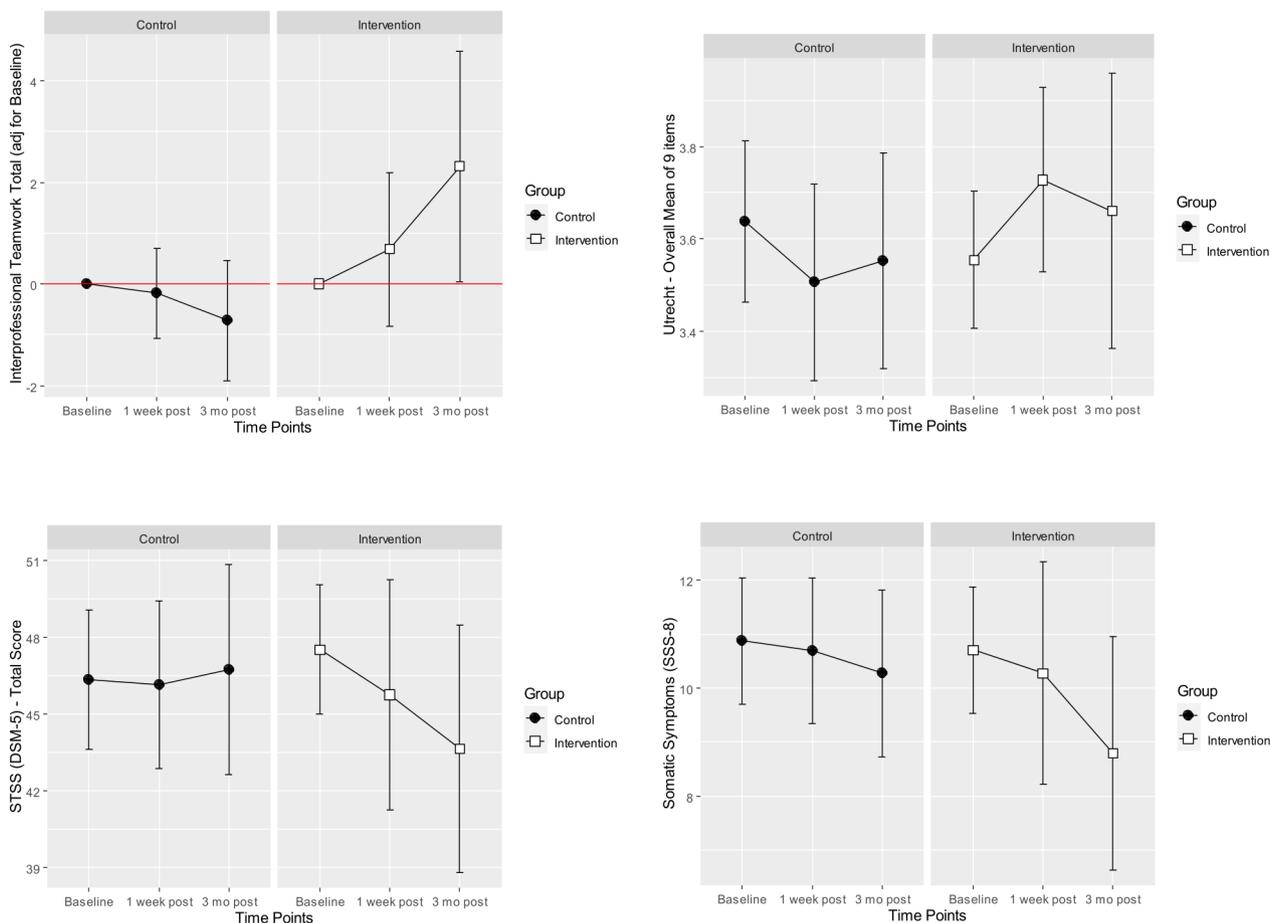
Quantitative outcome findings are included in online supplemental table 2. There was a lower rate of post-CRM training responses for the intervention group with 44 (34.9%) of the 126 intervention subjects completing their 1-week post-CRM training surveys compared with 94 (74.0%) of the 127 control subjects completing their 1-week surveys ( $\chi^2_{(1)}=38.99$ ,  $p<0.001$ ). For the 3-month postsurveys, 36 (28.6%) of the intervention subjects completed their surveys compared with 86 (67.7%) of the control subjects ( $\chi^2_{(1)}=38.82$ ,  $p<0.001$ ). The intervention group's higher attrition may be due to the extra burden of scheduling and attending a class during a stressful time, the first large surge of the pandemic. More than one-third of the intervention participants registered for a class but did not attend, despite reminders. Higher attrition for this group may also be due to the additional time lapse between initial enrolment and data collection.

Among intervention subjects who did complete postintervention surveys, significant improvements for the WHO-5 Well-Being Index, WEMWBS (two items), Interprofessional Teamwork Measure, MAIA-2 Noticing Scale and the STSS were seen compared with the control subjects. **Figures 2 and 3** present the results and plots of the longitudinal models of the group, time and group-by-time effects. For well-being, the time and group-by-time effects were statistically significant ( $p<0.05$ , **figure 2**), with significant post hoc tests for the control group from baseline to 3 months with a small effect size ( $d=0.25$ ), and significant ( $p<0.001$ ) post hoc tests for changes from baseline to 1 week and baseline to 3 months but with moderate to large effect sizes ( $d\geq 0.6$ ) for the improvements in the intervention group. Similar improvements for the intervention group were also seen for WEMWBS (two items) with significant time and group-by-time effects ( $p<0.001$ ) and significant post hoc tests for changes from baseline to 1 week and baseline to 3 months with moderate to large effect sizes ( $d=0.49$  and  $d=0.68$ , respectively). CD-RISC-2 and Utrecht total scores increased slightly in the intervention group at week 1, but no significant group-by-time nor post hoc tests were seen.

There were significant differences between the two groups at baseline for interprofessional teamwork (control group had scores higher than intervention at



**Figure 2** Well-being, resiliency and interoceptive awareness outcomes over time by group. CD-RISC-2, Connor-Davidson Resilience Scale-2; MAIA-2, Multidimensional Assessment of Interoceptive Awareness-2; WEMWBS, Warwick-Edinburgh Mental Well-Being Scale.



**Figure 3** Teamwork, Work Engagement, Stress and Somatic Symptoms Outcomes Over Time by Group.

baseline,  $p=0.020$ ), so the MLMs were performed on the change scores from baseline. The group and group-by-time effects were significant for changes from baseline ( $p<0.002$ , figure 3) with the intervention change scores increasing over time, indicating improvement from baseline (post hoc baseline to 3 months, small to moderate effect size,  $d=0.35$ ), whereas the change scores decreased over time for the control group, indicating worsening scores. For the MAIA Noticing Scale, there was a significant time effect and group-by-time effect ( $p<0.02$ ) with a moderate effect size for the changes from baseline to 3 months ( $d=0.52$ ). SS scores decreased more in the intervention group than in the control group, but these differences were not statistically significantly different. Finally, the STSS (stress) scores had a significant group-by-time effect ( $p=0.0074$ ) and the intervention group's scores were significantly reduced from baseline to 3 months with a moderate effect size ( $d=-0.44$ ).

Intervention participants also provided qualitative comments describing their use of CRM skills. These comments demonstrate the skills were appropriately being applied in professional and personal situations. Examples included using the grounding skill when 'dealing with stress', to 'get back to the here and now' and 'after a difficult conversation'. In addition, they reported practising 'my physical experience of feelings', 'calling out colors, sounds, physical touch sensations', 'looking outside at the

trees, sky, and nature', 'paying attention to how I feel in my body' and 'breathing consciously' to calm themselves.

## DISCUSSION

HCWs were recruited and randomised in a treatment/no treatment design. Treatment was a single, 1-hour, virtual CRM training. We found significant improvements for the WHO-5 Well-Being Index, WEMWBS (two items), Interprofessional Teamwork Measure, MAIA-2 Noticing Scale and the STSS-5 compared with the control subjects. This is the first time that a CRM training of a single hour length, a virtual format and a measure of interprofessional teamwork have been tested. Strengths of the study include its pragmatism and potential rapid application in healthcare organisations and practice settings. Inclusion of all manners of HCWs may be seen as a strength or a limitation as a non-homogeneous convenience sample. Sustainability and benefits of CRM practice beyond 3 months may not be imputed. Self-reported data also posed biases that included social desirability, response bias and sampling bias. The convenience sample and higher attrition in the intervention group underscores the practical nature of the intervention, but limits the generalisability of the findings.

At baseline, about 30% of the 253 HCWs reported good mental well-being, and the average score at baseline for

all participants was 48%, slightly below pre-COVID-19 measures among healthcare providers.<sup>19</sup> This speaks to the resilience of the HCWs. However, the finding that 19% of our sample had scores of less than 29, indicating risk for clinical depression, is considerably higher than the 11.3% identified in the pre-COVID-19 study.<sup>19</sup> The baseline mean of the CD-RISC-2 resilience measure was 5.5 for all participants, which is lower than the pre-pandemic general population mean of 6.91.<sup>26</sup>

Our short measure of interprofessional teamwork suggested that with just a brief introduction to CRM, participants had a significantly improved perception of team relations, with a moderate effect size (0.41), suggesting a clinically meaningful improvement over the 3-month study period. CRM may support an individual HCW's ability to stay emotionally regulated under stress and to maintain a teamwork perspective. This has implications for quality patient care.

SS scores (SSS-8) for the intervention group showed a consistent decline, with a mean score change from baseline (2.15) just short of a clinically significant change of 3.<sup>47</sup> The prevalence of STS was at 82.5% in the 253 baseline surveys, higher than published findings from other pandemic era studies such as in HCWs who had direct exposure to patients with COVID-19 (47.5%), or with HCWs exposed to patients dying of COVID-19 (67.1%).<sup>48</sup> Another feature of the STSS measure, in addition to severity of stress symptoms, is identification with criteria for PTSD. This study found that 33.3% of participants likely would have a PTSD diagnosis, which is also higher than the 28.9% predicted prevalence of PTSD in an HCW population studied before COVID-19.<sup>19</sup> The higher rate may be attributed to the pandemic; but that the rate is not even higher may point to the presence of an underlying resilience of HCWs.

The MAIA-2 body awareness measure demonstrates the link between interoceptive awareness and mental well-being.<sup>28</sup> The Noticing subscale showed a significant group over time effect with a moderate effect size of 0.52, meaning that the CRM group gained heightened somatic awareness. To our knowledge, the MAIA-2 has not been used to gauge the impact of a mental health intervention, but body awareness by itself has been associated with better clinical outcomes for depression and anxiety,<sup>29</sup> indicating that interoception interventions may eventually be a treatment option. Further research is needed on the role of interoception in supporting the well-being in HCWs.

The psychometric analysis of the new and untested teamwork measure was promising. Cronbach's alpha was 0.86; the measure has face validity with the concepts of teamwork and interdependence; the five questions were adapted intentionally from two psychometrically sound and tested instruments for the purpose of this study, suggesting content validity. The Work Engagement Scale is more personally versus relationally oriented than the team measure; scores for the intervention group increased compared with the control group and were sustained over

time but were only significant for one subscale (vigour) at the 0.06 level with a small effect size. This subscale is conceptually more aligned to the intervention than the two other subscales. In contrast to the decreased energy reported with burn-out, 'vigour' is characterised by high levels of energy and mental resilience while working, the willingness to invest effort in one's work and persistence even in the face of difficulties.<sup>36</sup> More studies may elucidate how CRM affects work engagement.

This study may be compared with other interventional research studies. It is clear from the flurry of recent publications that the mental well-being of HCWs is receiving critical and needed attention, and that mindfulness and coping interventions<sup>4</sup> or more comprehensive wellness interventions<sup>49</sup> are of great interest. Such interventions improve well-being and resilience,<sup>49</sup> but are of considerably longer training duration than CRM. CRM's strength is its brevity and orientation to the body itself as an in-the-moment tool for stress tolerance.

The self-reliance ethos of HCWs may impede access of behavioural healthcare. In a study of stress and alcohol consumption in HCWs, participants were using more alcohol to cope, and while they were open to 'stress management' help, they resisted interventions identified as 'behavioral health'.<sup>50</sup> How an intervention is couched appears to make a difference. It is important to identify and offer interventions that are brief, effective, acceptable, not resource intensive and prevention focused. Healthcare systems also need to manage the work environment to counteract occupational threats to HCW well-being.<sup>1</sup> The pandemic could prompt a needed shift towards systemic resiliency that is more empathetic, relationally oriented and patient centred, facets critical for quality healthcare.<sup>51</sup>

## CONCLUSION

HCWs around the world are at risk for mental health sequelae due to the relentless waves of COVID-19 and future disease outbreaks. It is critical to find solutions and ensure the health and safety of the millions in the US and global health workforce.<sup>52</sup> Resilience helps individuals manage stress and maintain an emotionally regulated response to heavy workloads or difficult working conditions. The well-being of the healthcare workforce is essential to maintain a productive and high-performing health system. At present, there is a paucity of evidence for HCW well-being interventions, so this current study adds appreciably to the current knowledge base. CRM is an individual-level intervention, and so will not ameliorate systemic issues that contribute to burn-out, or alone sustain organisational resilience. However, an individual-level intervention like CRM can be a part of larger systems-level solutions. As an accessible set of well-being skills, CRM offers individuals means to persist against adversities such as COVID-19. Organisations can adopt this feasible and prevention-focused approach to bolster individual resilience, creating an added benefit to the

workplace, as emotions and interpersonal interactions can be better managed. CRM skills can also be used with colleagues or clients, so more than just trained individuals benefit. A widespread adoption of CRM can lead to a healthier workforce; necessary to provide safe, quality patient care.

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**Contributors** IMD acted as the guarantor. IMD contributed to planning the study (design and implementation), data collection, implementation and interpretation of results. IMD and LG cowrote the initial manuscript draft, led the revisions and editing. MKH contributed to study planning and led the data analysis and helped interpret the results. MKH authored the draft analysis and results in the manuscript and approved the final draft before submission. DL contributed to planning the study, implementation (including the intervention) and interpretation of the results. DL served as an editor and approved the drafted manuscript before submission. MB contributed to planning the study, implementation (including the intervention) and interpretation of the results, and reviewed and approved the drafted manuscript before submission. JRM oversaw the data collection and contributed to the manuscript's findings section and approved revisions. LG contributed to planning the study (design and implementation) and interpretation of results.

**Funding** This work was supported, in part, by the Woodruff Health Sciences Center at Emory University via an Interprofessional Education and Collaboration Project Grant (IPEC).

**Disclaimer** The views expressed in the submitted article are those of the authors and not an official position of the institutions represented or the funder.

**Competing interests** None declared.

**Patient and public involvement** Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

**Patient consent for publication** Not applicable.

**Ethics approval** This study involves human participants and was approved by the Emory University Institutional Review Board (STUDY00001459). The study protocol includes procedures for recruitment and consent (online supplemental file 2). Participants gave informed consent to participate in the study before taking part.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** Data are available upon reasonable request.

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