

BMJ Open

BMJ Open is committed to open peer review. As part of this commitment we make the peer review history of every article we publish publicly available.

When an article is published we post the peer reviewers' comments and the authors' responses online. We also post the versions of the paper that were used during peer review. These are the versions that the peer review comments apply to.

The versions of the paper that follow are the versions that were submitted during the peer review process. They are not the versions of record or the final published versions. They should not be cited or distributed as the published version of this manuscript.

BMJ Open is an open access journal and the full, final, typeset and author-corrected version of record of the manuscript is available on our site with no access controls, subscription charges or pay-per-view fees (<http://bmjopen.bmj.com>).

If you have any questions on BMJ Open's open peer review process please email info.bmjopen@bmj.com

BMJ Open

The COVID-19 Emergency Response Assessment Study; a prospective longitudinal survey of frontline Doctors in the UK and Ireland: Study Protocol

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2020-039851
Article Type:	Protocol
Date Submitted by the Author:	28-Apr-2020
Complete List of Authors:	Roberts, Tom; The Royal College of Emergency Medicine, Daniels, Jo; University of Bath Hulme, William Horner , Daniel; The Royal College of Emergency Medicine; Salford Royal Hospitals NHS Trust, Department of Intensive Care Lyttle, Mark; Bristol Royal Hospital for Children, Emergency Department; University of the West of England, Faculty of Health and Applied Science Samuel, Katie; North Bristol NHS Trust, Department of Anaesthesia Graham, Blair; University of Plymouth; Plymouth Hospitals NHS Foundation Trust, Emergency Department Hirst, Robert; North Bristol NHS Trust, Department of Anaesthesia Reynard, Charles ; The University of Manchester Barrett, Michael; University College Dublin Carlton, Edward; North Bristol NHS Trust, Emergency Department; The Royal College of Emergency Medicine
Keywords:	ACCIDENT & EMERGENCY MEDICINE, ANAESTHETICS, INTENSIVE & CRITICAL CARE, PSYCHIATRY

SCHOLARONE™
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Title Page

The COVID-19 Emergency Response Assessment Study; a prospective longitudinal survey of frontline Doctors in the UK and Ireland: Study Protocol

Short Title

The CERA Study

Tom Roberts^{1, 2}, Jo Daniels³, William Hulme⁴, Dan Horner^{2, 5, 11}, Mark D Lyttle^{6, 7}, Katie Samuel⁸, Blair Graham^{9, 10}, Robert Hirst⁸, Charles Reynard¹¹, Michael J Barrett^{12, 13, 14} and Edward Carlton^{1, 2} on Behalf of TERN, PERUKI, RAFT, ITERN and SATARN

Corresponding Author: Dr Tom Roberts, Tomkieranroberts@gmail.com, 07894234121, 12 Hamilton Road, Bristol, BS3 1PB

Affiliations:

- 1) Emergency Department, North Bristol NHS Trust, Bristol, UK.
- 2) Royal College of Emergency Medicine, London, UK
- 3) Department of Psychology, University of Bath, UK
- 4) Centre for Health Informatics, University of Manchester, UK
- 5) Department of Intensive Care and Emergency Department, Salford Royal Hospital NHS Trust
- 6) Emergency Department, Bristol Royal Hospital for Children, UK
- 7) Faculty of Health and Applied Sciences, University of the West of England, Bristol
- 8) Department of Anaesthesia, North Bristol NHS Trust, UK
- 9) University of Plymouth
- 10) Emergency Department, University Hospitals Plymouth, UK
- 11) University of Manchester
- 12) Department of Emergency Medicine, Children's Health Ireland at Crumlin, Ireland
- 13) School of Medicine, Women's and Children's Health, University College Dublin, Ireland
- 14) Irish Association of Emergency Medicine, Ireland

Word Count: 4327

Abstract

Introduction

The COVID-19 pandemic is putting an unprecedented strain on healthcare systems globally. The psychological impact on frontline doctors of dealing with the COVID-19 pandemic is currently unknown. This longitudinal professional survey aims to understand the evolving and cumulative effects of working during the COVID-19 outbreak on the psychological wellbeing of doctors working in Emergency Departments (ED), Intensive Care Units (ICU) and Anaesthetics during the pandemic.

Methods and Analysis

This study is a longitudinal questionnaire based study with three pre-defined time points spanning the acceleration, peak, and deceleration phases of the COVID-19 pandemic. The primary outcomes are psychological distress and post-trauma stress as measured by the General Health Questionnaire-12 (GHQ-12) and Impact of Events Scale-Revised (IES-R). Data related to personal and professional characteristics will also be collected. Questionnaires will be administered prospectively to all doctors working in ED, ICU and Anaesthetics in the UK and Ireland via existing research networks during the sampling period. Data from the questionnaires will be analysed to assess the prevalence and degree of psychological distress and trauma, and the nature of the relationship between personal and professional characteristics and the primary outcomes. Data will be described, analysed and disseminated at each time point; however, the primary endpoint will be psychological distress and trauma at the final time point.

Ethics

Ethical approval was obtained from University of Bath, UK (ref:4421), and Children's Health Ireland at Crumlin, Ethics Committee. (Online Supplementary 2) Regulatory approval from the Health Regulation Authority (UK), Health and Care Research Wales (IRAS: 281944). (Online Supplementary 3).

Dissemination

1
2
3 Interim study reports will be prepared for public dissemination. On study completion a final
4 manuscript will be submitted to a peer reviewed scientific journal and shared with National
5 Royal Colleges to inform the impact of the pandemic upon this critical workforce.
6
7
8
9

10 Registration Details –

11
12 ISRCTN: 10666798
13
14

15 16 Article Summary

17 18 Strengths and Limitations of this Study

- 19
20 • This longitudinal study will assess psychological wellbeing in frontline doctors, at
21 three time points across the pandemic wave, providing novel data in this potentially
22 at-risk group
23
- 24 • Both the GHQ-12 and IES-R have both been previously used in infectious disease
25 outbreaks to measure psychological distress and trauma response
26
- 27 • Collection of data at the 'peak' phase, capturing the degree of distress and personal
28 and professional factors associated with distress at a prime timepoint of maximal
29 stress upon frontline doctors.
30
- 31 • Pre-determined data collection points are reliant on national reporting and may not
32 accurately reflect local or regional variations in systems pressure.
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Introduction

Severe Acute Respiratory Syndrome Virus Covariant 2 (SARS-CoV-2) is a presumed zoonotic novel coronavirus that first emerged in the province of Hubei, China during late 2019. (1) Viral transmission is presumed to be via droplet spread and it multiplies in respiratory epithelium. Clinical manifestations of the resulting COVID-19 disease include bilateral interstitial pneumonia, acute respiratory distress syndrome, and multi-organ dysfunction syndrome. (2) Due to high transmissibility, hospitalisation rates, critical care requirements and mortality rate in elderly and vulnerable populations, COVID-19 has created a public health emergency, (3) and was declared a pandemic by the World Health Organisation on the 11th March 2020. (4)

Clinicians in acute and critical healthcare services provide medical care at the point of highest risk of disease transmission, and frequently undertake aerosol generating procedures which increase their exposure to SARS-CoV-2. During comparable infectious disease outbreaks such as SARS-CoV and Ebola, healthcare workers were over-represented in disease incidence and poor clinical outcomes. Such concerns relating to COVID-19 are reflected in experiences anecdotally reported from the international healthcare community. (5)

In the UK and Ireland, doctors working in Emergency Departments (ED), Intensive Care Units (ICU) and Anaesthetics will be responsible for the initial identification, management and ongoing treatment of patients presenting with COVID-19. In addition, many difficult decisions relating to treatment escalation and resource allocation for individual patients will be made by clinicians working in these key areas. Many doctors are likely to be redeployed to these clinical areas or asked to work beyond their level of seniority. In addition, these doctors are likely to be directly responsible for the care of colleagues and staff members with the infection.

Resources in these clinical areas are already stretched at baseline. Operational pressures within EDs, critical care settings and emergency anaesthetic provision have been severe and escalating over a period of many years. This is reflected in the time to complete care episodes and health outcomes (6), the impact of fatigue and burnout within anaesthesia and ICU

1
2
3 training (7) and the UK and Ireland having some of the lowest numbers of critical care beds
4 per 100,000 of population in Europe. (8) This has resulted in concerns regarding surge
5 capacity of facilities to cope with a pandemic illness. (9) The psychological, emotional and
6
7 physical demands placed on an already overstretched workforce may therefore be
8
9 substantial.

10
11
12
13
14 It is evident from a substantial body of research across disaster settings that there is often a
15 significant and long-lasting negative impact on the psychological wellbeing of clinicians
16 involved. (10,11) Similar themes are also emerging from the COVID-19 pandemic in a cross-
17 sectional survey undertaken in selected healthcare workers in China. (12)

18
19
20
21
22
23 Key factors in predicting psychological distress post trauma span a range of domains and
24 include preparedness and training, (13–15) social and occupational support, (13–16), risk
25 exposure and threat to life, (14,16,17) self-isolation, (14,16,18) media use (19,20) negative
26 affect following exposure, (14,16–18) history of mental health problems and previous
27 trauma. (15,17,18) Yet, these have largely been identified post-hoc, in the aftermath of
28 events and without prospective data collection or a comprehensive understanding of the
29 relative impact of these factors as an event unfolds.

30
31
32
33
34
35
36
37
38 To date, no large-scale longitudinal studies have proposed to prospectively examine the
39 psychological distress and trauma response in clinicians during the acceleration, peak and
40 deceleration phase of the pandemic wave of COVID-19. This study aims to understand the
41 evolving and cumulative effects of working in EDs, ICUs and Anaesthesia during the COVID-19
42 outbreak, specifically seeking to understand key personal and professional factors which
43 predict psychological distress in this cohort of frontline doctors.

44 45 46 47 48 49 50 51 **Methods and Analysis**

52
53 The primary aim of this study is to assess the prevalence and degree of psychological distress
54 and trauma in doctors providing frontline care during the acceleration, peak, and deceleration
55 phases of the COVID-19 pandemic, and furthermore establish which personal and
56 professional factors are associated with psychological distress at these time points.
57
58
59
60

1
2
3
4
5
6
7 More specifically, the objectives are to:

- 8 1. Evaluate personal and professional factors contributing to psychological wellbeing at
9 the acceleration, peak, and deceleration phase of the pandemic
- 10 2. Establish the incidence of self-reported COVID-19 infection and self-isolation amongst
11 frontline doctors, and to evaluate any association with psychological wellbeing
- 12 3. Assess regional and national variation of psychological distress and trauma in doctors
13 within the UK and Republic of Ireland

21 22 Study Design and Conduct

23
24 This prospective online longitudinal survey consists of three phases commensurate with the
25 fluctuation of an initial pandemic wave of COVID-19 in the UK and Ireland. More specifically:

- 26 • Phase 1: Acceleration Survey; administered at 0 months (March 2020)
- 27 • Phase 2: Peak Survey; administered on day 7 following the pandemic peak, as defined
28 by COVID-19 related hospital deaths, in the UK and Ireland
- 29 • Phase 3: Deceleration Survey; administered 30 days following the peak survey.

30
31
32
33
34
35
36
37
38
39 These three phases have been adapted from the Centre for Disease Control (CDC)
40 “Preparedness and Response Framework for Influenzae Pandemics”(Figure 1). (21)

41
42
43
44
45 *Figure 1. Timing of Surveys in accordance with pandemic preparedness model. Solid blue line represents date of survey
46 issue, transparent blue area represents data collection period (As adapted from the CDC (21))*

47 48 49 50 51 Outcome Measures

52
53 The co-primary outcome measures will be GHQ-12 scores from Phase 1, 2 and 3 surveys, and
54 the IES-R score in Phase 2 and 3 surveys.

1
2
3 The General Health Questionnaire - 12 (GHQ-12) (22) is a brief, validated, 12 item self-
4 report measure devised to screen for psychological distress in the general population. The
5 measure has high specificity and sensitivity, with reliability demonstrated across a range of
6 cultures and populations. (23) The GHQ-12 has been used in similar clinician-based studies
7 measuring the psychological impact of infectious outbreaks (14) and was chosen due to the
8 brevity of the measure and its suitability for time pressured medical staff. The GHQ-12 can
9 be scored using several methods, however the most commonly utilised, which has the
10 highest sensitivity and specificity overall, is the 0-0-1-1 method. (23) A score of >3 indicates
11 case level distress. (24) In addition to this method the 0-1-2-3 scoring method to detect
12 within-person changes will be used, as this is deemed more sensitive to changes across time
13 points; there is no established cut-off and this technique reflects degree of distress rather
14 than threshold caseness. The GHQ-12 assesses current state (rather than long-standing
15 attributes) and asks the participants to compare to usual state.
16
17
18
19
20
21
22
23
24
25
26
27
28

29 The Impact of Events Scale - Revised (IES-R) (25) is a 22 item measure commonly used to
30 measure post-traumatic stress following a pre-specified traumatic incident. Items are scored
31 on a Likert scale, ranging from 0 representing 'not at all' to 4 representing 'extremely'. The
32 IES-R has been commonly used in infectious disease outbreaks to assess post-traumatic stress
33 in hospital staff. (14) The IES-R has three subscales, relating to intrusion, avoidance and
34 hyperarousal. Responses will be analysed similarly to the GHQ-12, assigning the responses as
35 0, 1, 2, 3, 4 (positive to negative) producing a score in the range 0 to 88. A score of 24 or above
36 will indicate a clinically significant stress response.
37
38
39
40
41
42
43
44

45 Secondary outcome measures will be pre-defined personal and professional characteristics
46 (Online Supplementary 1) and their association with psychological distress as defined by GHQ-
47 12 and IES-R. The self-reported rate of self-isolation amongst doctors, the quantity of clinical
48 shifts missed and rates of COVID-19 infection will also be measured.
49
50
51
52
53
54
55
56
57
58
59
60

Participants

Frontline medical staff employed in their main role as a doctor in the ED, ICU or Anaesthetics in the UK and Ireland at the point of study commencement will be invited to participate. All grades of medical staff will be eligible to participate.

Doctors who move clinical setting between surveys will not be excluded, provided they remain within an acute trust setting. Doctors whose main place of employment at the point of study commencement is not the ED, ICU or Anaesthetics and Non-doctors working in ED, ICU or Anaesthetics will be excluded.

Survey Distribution

All potential participants will be invited to participate in the Phase 1 survey through established acute care research networks: in Emergency Medicine, members of the Trainee Emergency Research Network (TERN), Irish Trainee Emergency Research Network (I-TERN), Irish Association of Emergency Medicine and Paediatric Emergency Research in the UK and Ireland (PERUKI) will be invited to register as participating sites via email and instant messaging groups. A site lead will be identified in each centre who will be responsible for distributing the participation link for Phase 1 Survey and encouraging participation through the display of relevant materials. In order to mitigate against non-UK or Ireland doctors and other healthcare groups completing the survey, the participation link will not be shared on wider social media platforms.

In the fields of Intensive Care and anaesthesia, participants will be invited to complete the Phase 1 Survey via the UK Research and Audit Federation of Trainees (RAFT) network membership groups and the Irish Specialist Anaesthesiology Trainee Audit & Research Network (SATARN) via email and instant messaging. Additionally, participation invitations will be disseminated by the Royal College of Anaesthetists, College of Anaesthesiologists of Ireland and National Institute of Health Research (NIHR) Clinical Research Networks (including

1
2
3 Trauma and Emergency Care, Critical Care and Anaesthesia & perioperative medicine) via
4 email to regional leads, with additional invitations to all UK anaesthetists via the Lifelong
5 Learning Platform. The Trainee Research in Intensive Care network (TRIC) will also distribute
6 the survey link amongst their members and through the Faculty of Intensive Care Medicine
7 (FICM).
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For peer review only

Survey Design

The survey has been designed and managed in line with the Checklist for Reporting Results of Internet E-surveys (CHERRIES) guidelines. (26)

A summary of survey construction is outlined in Table 1. Each survey was developed iteratively by the study team and underpinned by evidence where available, or by consensus where necessary. Literature reviews were performed to identify factors with potential impact on psychological distress and trauma. Psychometric tools were selected by consensus of the study team, considering validity and utility of a range of measures, balanced against the feasibility of delivery and completion by individuals likely to be working at maximum capacity. Each survey will be piloted by members of the study team prior to full release.

Study Phase	Survey	Characteristics								Psychometric Evaluation	
		Informed Consent	Basic Demographic Data	Work Related Data	Self-Assessment Preparedness	Personal factors	Experiences of self-isolation	Self-reported diagnosis	Post event support	Psychological Wellbeing	Trauma response
										GHQ12 ¹	IESR ²
Acceleration	1	✓	✓	✓	✓	✓	✓	-	-	✓	
Peak	2	✓	-	✓	✓	✓	✓	✓	✓	✓	✓
Deceleration	3	✓	-	✓	✓	✓	✓	✓	✓	✓	✓

¹General Health Questionnaire ²Impact of Events Scale- Revised

Table 1: Study design summary table

Phase 1: Acceleration Survey

Phase 1 survey (Online Supplementary 1) will gather consent and contact e-mail address, selected personal and professional characteristics and responses to the GHQ-12 survey.

Phase 2: Peak Survey

All participants who completed the Phase 1 survey will be invited to complete Phase 2 and 3 surveys. The Phase 2 Survey will gather consent and additional demographic, experiential or work-related data. No additional personal identifiable information will be taken. Participants will be requested to complete a serial evaluation of GHQ-12 and the IES-R; these are both valid and reliable short-form measures of their original counterparts and are used in order to limit participant fatigue.

Phase 3: Deceleration Survey

Phase 3 Survey will gather consent and further data on personal and professional factors. No additional personal identifiable information will be taken, and it will be ensured that the survey does not exceed a reasonable length, to limit participant fatigue. Participants will be requested to complete a serial evaluation of GHQ-12 and IES-R.

Survey Timeline

Identification of pandemic phases to guide survey release

The surveys will be released in-keeping with the CDC pandemic framework outlined in Figure 1. As the current outbreak is dynamic by its very nature, the exact timings of the peak and deceleration phases are uncertain but will be identified using the below criteria.

Identification of Acceleration Phase

The authors reached a consensus decision on 17th March 2020, based on best available evidence from Public Health England (PHE) that the UK was in the 'acceleration phase' of the

1
2
3 current COVID-19 outbreak. Phase 1 survey was opened on March 18th 2020, for a period of
4 ten days.
5
6
7
8

9 *Identification of Peak Phase*

10
11 The authors will hold regular remote meetings to monitor the evolving COVID-19 outbreak.
12 The 'Peak' survey will be released 7-days after the *first* UK and *first* Republic of Ireland
13 national peaks of COVID-19 related deaths. Nationally reported death rates have been chosen
14 rather than confirmed cases due to a lack of consistency in screening and reporting of
15 confirmed cases in the UK and Ireland. As UK national death rates are publicly available, in
16 comparison to regional death rates, it is recognised that regional variation may occur.
17 The UK and Republic of Ireland national peaks will be decided by a consensus decision of the
18 Study Management Group, which will be recorded and documented in the final study
19 report. The consensus decision will be guided by:
20
21
22
23
24
25
26
27

- 28 • Publicly available COVID-19 daily death rates data from PHE (accessed via:
29 <https://coronavirus.data.gov.uk>) and Ireland's Department of Health (accessed via:
30 <https://www.gov.ie/en/news/7e0924-latest-updates-on-covid-19-coronavirus/>)
31
32
33 • Government daily briefings
34
35 • Published modelling literature
36
37
38

39 The survey will remain open for 14 days to ensure maximal response rates.
40
41
42

43 *Identification of Deceleration Phase*

44
45 The deceleration phase will be defined as 30 days after the administration of the 'Peak'
46 Survey. The survey will remain open for 14 days.
47
48
49
50

51 **Informed Consent**

52
53 Electronic informed consent will be obtained prior to completion of each round of the
54 surveys.
55
56
57
58
59
60

Withdrawal

Participants can exit the survey online if they no longer wish to take part at any time. However, it will be clear in the introductory statement that data from questions already completed may be analysed.

Administration

The survey will be administered via the online platform REDCap. (16) This electronic data capture platform is fully compliant with Good Clinical Practice, 21 CFR Part 11, GDPR, 20 ISO 27001 and ISO 9001.14. It has stringent data security procedures and uses private servers. Data will be held securely on secure online server hosted by the University of Bristol, UK.

PPI and Stakeholder Engagement

Staff wellbeing was rated the fourth highest priority of the James Lind Alliance Priority Setting Partnership, (27) which involved extensive consultation with clinicians, patients, public and carers. This study does not directly involve patients; however, the potential impact that psychological trauma in doctors could have for patient care is concerning. Due to the urgency and unprecedented nature of the current situation, patient and public involvement directly related to this study has not been possible during the development of this protocol. It was felt inappropriate to seek stakeholder engagement from doctors over the short study development period as it could have detracted from pressing clinical demands.

Statistical Analysis Plan

Response Rate

This will be presented using the CHERRIES checklist specifications. (12) An overall response rate denominator will be reported using data provided by the General Medical Council (GMC) on doctors currently registered and working in ED, Anaesthetics and ICU in the UK. Estimates

1
2
3 on the denominator for participants from Ireland will be reported using data provided by
4 individual hospital departments on doctors working in the ED, Anaesthetics and ICU.
5
6
7
8

9 Analysis cohort (inclusion / exclusion criteria)

10
11 Non-consented, duplicate (by email address) and non-completion of the minimum required
12 dataset for analysis (completion of GHQ-12, grade and hospital) will be excluded. Duplicates
13 are handled as follows: where two or more email addresses are present, the most complete
14 survey will be taken. Note that a complete survey may include unanswered questions.
15
16
17

18 The primary analysis cohort will comprise participants who have completed the GHQ-12 in
19 all 3 surveys and the IES-R in surveys 2 and 3. Sub-analyses of completed surveys 1, 2, and 3,
20 irrespective of completion of other survey, will also be reported.
21
22
23
24

25
26 Due to the difference in COVID-19 related policy between the Governments of the UK and
27 Republic of Ireland, there may be a difference in timing of the pandemic wave. This could
28 result in a significant difference of the study populations. Therefore, a study management
29 group decision will be made, prior to final analysis, in regard to whether the difference of
30 timing of the UK and Republic of Ireland's pandemic waves precludes joint analysis. Any
31 decision will be documented in the final study report.
32
33
34
35
36
37

38 Descriptive Statistics

39
40 Descriptive statistics relating to participants' personal and professional characteristics will be
41 presented overall and by department/geographic region.
42
43
44
45

46 GHQ-12 items will be analysed both individually and aggregated into an overall score using
47 the 0-1-2-3 method. This method assigns responses to 0, 1, 2, 3 (positive to negative
48 sentiment) producing a score in the range 0 to 36, with zero representing the most healthy
49 response and 36 the most unhealthy. Note that for case identification, the 0-0-1-1 method
50 is used (see outcome measures and Table 2).
51
52
53
54
55

56 IES-R responses will be analysed similarly, by assigning the responses to 0, 1, 2, 3, 4 (positive
57 to negative) producing a score in the range 0 to 60.
58
59
60

The distribution of GHQ-12 and IES-R scores will be presented graphically, with an appropriate measure of central tendency and variation provided. Comparisons between different personal and professional characteristics will also be made. Distributional (median, Q1, Q3) and mean differences will be reported. Proportions of respondents meeting thresholds of clinically significant impairment will be derived for each of the psychometric measures, as outlined in Table 2.

These descriptive analyses will be performed for the primary analysis cohort and the survey-specific sub-cohorts. Participant dropout rates from survey one to surveys two and three will be reported.

Table 2 – Threshold scores for the GHQ-12 and IES-R

	Thresholds for clinical significance of each of the psychometric evaluations
GHQ-12 General Function	<ul style="list-style-type: none"> 4 or above on the 0-0-1-1 scoring system represents significant health impairment
IES-R Trauma	<ul style="list-style-type: none"> 24 or above on the 0-1-2-3-4 scoring system represents clinically significant stress response

Inter-survey analysis

The models outlined are descriptive, with model parameters intended to summarise observed statistical relationships rather than estimating underlying causal effects. No formal null hypothesis significance testing will be performed to determine the presence or absence of statistically significant effect sizes, though p-values for model estimates will be reported for reference.

Change in the GHQ-12-score

The change over time in the GHQ-12 score amongst participants who responded to all three surveys will be examined. Graphical relationships between the trend in the GHQ-12 score and variables collected at Phase 1 Survey will be presented.

A repeated measures non-linear mixed effect model will be deployed. The dependent variable, GHQ score as measured on three consecutive occasions, is indexed either by survey response date (in continuous-time) or by survey epidemic phase (before, during, and after the epidemic peak). Models based on both indices will be investigated.

For the time-indexed model, a quadratic relationship between time and GHQ will be permitted (given the potential for a rise then fall in GHQ-12 over the course of the epidemic).

Region-level random-effects on the intercept and time will be included in both time- and phase-indexed models. Hospital-level random effects may also be investigated, depending on the number of responses per hospital. Whilst hospital-level random effects would more appropriately account for between-hospital heterogeneity than region-level random effects, it is anticipated that some hospitals will only be represented by only a very small number of participants, which may cause problems for model identification.

To identify potential modifiers of GHQ-12-score change, further models each with a single additional covariate will be built, with the likelihood ratio used to assess the degree of improvement in the model.

Impact of Events Scale-Revised

The IES-R score amongst participants who responded to all three surveys will be examined. Graphical relationships between the IES-R score and variables collected at survey 1 will be presented.

A linear model will be deployed seeking to account for the variation in the IES-R score with survey 1 variables.

1
2
3 To identify potential pre-peak modifiers of IES-R-score (for instance to identify characteristics
4 that put clinicians at higher risk of trauma following an epidemic), further models each with
5 a single additional covariate will be built, and a likelihood ratio test performed to assess the
6 improvement in the model. For phase 3 models, the IES-R score from phase 2 will also be
7 included as a covariate.
8
9
10
11
12
13

14 Procedure for accounting for missing, unused and spurious data

15
16 Information on completeness for each variable will be reported. For the primary models,
17 missing values will be imputed using multi-level fully conditional specification multiple
18 imputation with 100 imputed datasets to be created. (28–30) For consistency, the same
19 imputed datasets will be used across all models. Categorical variables will be imputed using
20 multinomial logistic regression and ordinal variables using ordinal regression. The only
21 continuous variables are GHQ-12 score and IES-R but these will be derived anew following
22 imputation of the individual questions and will not be imputed directly. Imputation will not
23 be necessary for region, grade, and specialty as these are complete by design due to the
24 exclusion criteria. An “impute-then-delete” strategy will be employed for the dependent
25 variable. Effect estimates across imputed datasets will be pooled using Rubin’s rules. (31)
26
27
28
29
30
31
32
33
34
35
36
37

38 Software

39
40 All analyses and statistical outputs will be produced in the statistical programming language
41 R. The lme4 package will be used for the mixed-effects models.
42
43
44
45
46
47

48 Procedures for reporting any deviation(s) from the original statistical plan

49
50 Any requirement to deviate from the original statistical plan will be discussed with the Study
51 Management Group and independently reviewed by an external statistician, where
52 appropriate, and documented appropriately with a full explanation as to reasoning and
53 requirement.
54
55
56
57
58
59
60

Data Storage

Data will be stored electronically for 5 years by the University of Bristol.

Ethical and Regulatory Issues

Ethical Approval

This project has ethical approval from University of Bath, UK and Children's Health Ireland at Crumlin, Ethics Committee. Regulatory approval was obtained from the Health Regulation Authority (UK), Health and Care Research Wales.

Risk to participants

This survey collects potentially sensitive information, which will be handled in accordance with General Data Protection Regulations. This includes details on participants' baseline health status and psychometric evaluations of anxiety, depression and post-traumatic stress. It will be emphasised in the participant information sheet that such measures are non-diagnostic and that the purpose of the study is to monitor psychological wellbeing on a population level. As scales are being used for non-diagnostic purposes, feedback will not be provided to participants regarding their scores. Participants will be given the option to not disclose existing physical or mental health complaints with these questions listed as 'optional'. It is possible that questions relating to personal health and wellbeing may trigger emotive responses in participants. Participants will be signposted to suggested local and national sources in the UK and Ireland where they may obtain support at the beginning and end of each survey.

Risk to investigators

There are no anticipated additional risks to investigators as part of this study. The study may generate media interest. All media releases will be conducted through the Sponsor and/or

1
2
3 publishing journals. Media interviews will be undertaken by a senior member of the study
4 group with media training.
5
6
7
8
9

10 Dissemination

11
12 Interim study reports will be prepared for public dissemination. On study completion a final
13 manuscript will be submitted to a peer reviewed scientific journal and shared with Medical
14 Royal Colleges to inform stakeholders of the pandemic impact upon this critical workforce.
15
16 The results will be disseminated widely at scientific conferences.
17
18
19
20

21 Discussion

22
23 This large-scale prospective longitudinal survey of frontline doctors builds on previous work
24 regarding psychological wellbeing in acute care settings and looks to assess the
25
26 psychological impact of the COVID-19 pandemic upon frontline doctors, specifically seeking
27
28 to understand key personal and professional factors which predict psychological distress in
29
30 this cohort. Findings will be discussed in relation to the current context and in light of the
31
32 reported impact of previous infectious disease outbreaks, aiming to contribute to novel data
33
34 on frontline doctors' mental health in a rapidly emerging field.
35
36
37
38

39
40 Concerns have been raised regarding the potential and likely negative psychological impact
41 of increasing workload in the already stretched ED clinical environment, with anticipation
42 that this will be exacerbated by the specific and significant challenges of work during the
43
44 COVID-19 pandemic. (32,33) In line with previous research, frontline healthcare workers
45
46 are likely to be affected by fears of contamination, disruption of normal supportive
47
48 structures and work stress. (34) However, there is a paucity of data to quantify these
49
50 effects. This collaborative research project, which harnesses the extensive reach of
51
52 research networks, and supported by national professional bodies (such as the Medical
53
54 Royal Colleges), seeks to address an important research question through rapid mobilisation
55
56 of existing research infrastructures. The immediate outputs of this work will aim to inform
57
58 the psychological response to this infection wave and future infection waves by robustly
59
60 assessing the degree of psychological distress and trauma in the frontline workforce,

1
2
3 furthermore gaining a greater understanding of the potentially modifiable personal and
4 professional factors that predict distress. Establishing need is imperative given that trauma
5 and psychological distress has been repeatedly demonstrated negative impact on
6 occupational performance, job satisfaction, physical and psychological. (35–37) By robustly
7 identifying predictive factors associated with mental health outcomes in this population,
8 targets for intervention will be provided; treatment for trauma and psychological distress is
9 evidence-based, efficacious and widely available on the NHS. (38) Recent advancements in
10 psychological therapy provision have expanded adaptations for the frontline staff
11 workforce, (39) however there is currently a lack knowledge concerning the precise
12 prevalence and degree of distress and what characterises those who are most affected. This
13 knowledge is essential to enable tailoring of support, treatment and pathways appropriate
14 to need. This research aims to address that gap and provide a foundation from which to
15 shape service development in order to improve outcomes in this critical workforce.
16
17
18
19
20
21
22
23
24
25
26
27
28

29 The primary limitation to this work lies in estimating the peak phase, and therefore the
30 timepoint of maximal stress upon frontline doctors. This is reliant on national reporting and
31 may not reflect local or regional variations in systems pressure. However, given the high
32 response rate and sample size in the acceleration phase survey, it is planned to mitigate
33 regional effects through pre-defined subgroup analysis. Due to the rapidly developing
34 nature of the pandemic, constraints have prevented the gathering of qualitative data as part
35 of this study. Further research should explore the nature of distress in this population,
36 drawing out themes that would enhance depth of knowledge in this area.
37
38
39
40
41
42
43
44

45 In conclusion, this longitudinal professional survey aims to robustly assess the psychological
46 impact of the COVID-19 pandemic on frontline doctors, using sequential assessment to
47 assess prevalence and degree of psychological distress across three key timepoints, defining
48 the nature of the relationship between key personal and professional factors and primary
49 outcomes of psychological distress and trauma response. This information will provide vital
50 understanding of the impact of the COVID-19 pandemic on healthcare and wellbeing
51 amongst clinical responders which will help tailor interventions and provide data for future
52 planning of psychological support.
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For peer review only

References

1. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet*. 2020 Feb 15;395(10223):507–13.
2. Guan W, Ni Z, Hu Y, Liang W, Ou C, He J, et al. Clinical Characteristics of Coronavirus Disease 2019 in China. *N Engl J Med* [Internet]. 2020 Feb 28 [cited 2020 Mar 31];NEJMoa2002032. Available from: <http://www.nejm.org/doi/10.1056/NEJMoa2002032>
3. Mahase E. China coronavirus: WHO declares international emergency as death toll exceeds 200. *BMJ*. 2020 Jan 31;368:m408.
4. WHO Director-General’s opening remarks at the media briefing on COVID-19 - 11 March 2020 [Internet]. [cited 2020 Mar 31]. Available from: <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>
5. Chang D, Xu H, Rebaza A, Sharma L, Dela Cruz CS. Protecting health-care workers from subclinical coronavirus infection. Vol. 8, *The Lancet Respiratory Medicine*. Lancet Publishing Group; 2020. p. e13.
6. What’s behind the A&E “crisis”? | The Nuffield Trust [Internet]. [cited 2020 Mar 31]. Available from: <https://www.nuffieldtrust.org.uk/resource/what-s-behind-the-a-e-crisis>
7. Looseley A, Wainwright E, Cook TM, Bell V, Hoskins S, O’Connor M, et al. Stress, burnout, depression and work satisfaction among <sc>UK</sc> anaesthetic trainees; a quantitative analysis of the Satisfaction and Wellbeing in Anaesthetic Training study. *Anaesthesia* [Internet]. 2019 Oct 15 [cited 2020 Apr 8];74(10):1231–9. Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1111/anae.14681>
8. Bittner M-I, Donnelly M, van Zanten AR, Andersen J, Guidet B, Trujillano Cabello J, et al. How is intensive care reimbursed? A review of eight European countries. *Ann Intensive Care* [Internet]. 2013 Nov 12 [cited 2020 Mar 28];3(1):37. Available from: <http://annalsofintensivecare.springeropen.com/articles/10.1186/2110-5820-3-37>
9. Ferguson N, Laydon D, Nedjati- Gilani G et al. Impact of non-pharmaceutical interventions (NPIs) to reduce COVID19 mortality and healthcare demande. 2020;

- 1
2
3 Available from: [https://www.imperial.ac.uk/media/imperial-](https://www.imperial.ac.uk/media/imperial-college/medicine/sph/ide/gida-fellowships/Imperial-College-COVID19-NPI-modelling-16-03-2020.pdf)
4 [colle
5 ge/medicine/sph/ide/gida-fellowships/Imperial-College-COVID19-NPI-modelling-
6 16-03-2020.pdf](https://www.imperial.ac.uk/media/imperial-college/medicine/sph/ide/gida-fellowships/Imperial-College-COVID19-NPI-modelling-16-03-2020.pdf)
7
8
9 10. Naushad VA, Bierens JJLM, Nishan KP, Firjeeth CP, Mohammad OH, Maliyakkal AM, et
10 al. A Systematic Review of the Impact of Disaster on the Mental Health of Medical
11 Responders. Vol. 34, Prehospital and Disaster Medicine. Cambridge University Press;
12 2019. p. 632–43.
13
14
15 11. Lin CY, Peng YC, Wu YH, Chang J, Chan CH, Yang DY. The psychological effect of severe
16 acute respiratory syndrome on emergency department staff. *Emerg Med J* [Internet].
17 2007 Jan [cited 2020 Mar 31];24(1):12–7. Available from:
18 <http://www.ncbi.nlm.nih.gov/pubmed/17183035>
19
20
21
22 12. Lai J, Ma S, Wang Y, Cai Z, Hu J, Wei N, et al. Factors Associated With Mental Health
23 Outcomes Among Health Care Workers Exposed to Coronavirus Disease 2019. *JAMA*
24 *Netw open*. 2020 Mar 2;3(3):e203976.
25
26
27
28 13. Brooks SK, Dunn R, Sage CAM, Amlôt R, Greenberg N, Rubin GJ. Risk and resilience
29 factors affecting the psychological wellbeing of individuals deployed in humanitarian
30 relief roles after a disaster. *Journal of Mental Health*. 2015.
31
32
33 14. Brooks SK, Dunn R, Amlôt R, Rubin GJ, Greenberg N. A Systematic, Thematic Review
34 of Social and Occupational Factors Associated with Psychological Outcomes in
35 Healthcare Employees during an Infectious Disease Outbreak. *J Occup Environ Med*.
36 2018;
37
38
39 15. Lancee WJ, Maunder RG, Goldbloom DS. Prevalence of psychiatric disorders among
40 Toronto hospital workers one to two years after the SARS outbreak. *Psychiatr Serv*.
41 2008;
42
43
44 16. Maunder RG, Lancee WJ, Rourke S, Hunter JJ, Goldbloom D, Balderson K, et al.
45 Factors associated with the psychological impact of severe acute respiratory
46 syndrome on nurses and other hospital workers in Toronto. *Psychosomatic Medicine*.
47 2004.
48
49
50 17. Ozer EJ, Best SR, Lipsey TL, Weiss DS. Predictors of posttraumatic stress disorder and
51 symptoms in adults: A meta-analysis. Vol. 129, *Psychological Bulletin*. American
52 Psychological Association Inc.; 2003. p. 52–73.
53
54
55 18. Brooks SK, Webster RK, Smith LE, Woodland L, Wessely S, Greenberg N, et al. The
56
57
58
59
60

- 1
2
3 psychological impact of quarantine and how to reduce it: rapid review of the
4 evidence. *The Lancet*. 2020.
5
6
7 19. Jones NM, Thompson RR, Schetter CD, Silver RC. Distress and rumor exposure on
8 social media during a campus lockdown. *Proc Natl Acad Sci U S A*. 2017;
9
10 20. Torales J, O'Higgins M, Castaldelli-Maia JM, Ventriglio A. The outbreak of COVID-19
11 coronavirus and its impact on global mental health. *Int J Soc Psychiatry* [Internet].
12 2020 Mar 31 [cited 2020 Apr 15];002076402091521. Available from:
13
14 <http://journals.sagepub.com/doi/10.1177/0020764020915212>
15
16
17 21. Holloway R, Rasmussen SA, Zaza S, Cox N, Jernigan D. Updated Preparedness and
18 Response Framework for Influenza Pandemics [Internet]. 2014 [cited 2020 Apr 8].
19 Available from: <https://www.cdc.gov/mmwr/preview/mmwrhtml/rr6306a1.htm>
20
21
22 22. Goldberg D, Williams P. A user's guide to the General Health Questionnaire. London:
23 GL Assessment; 1988. 129 p.
24
25
26 23. Goldberg DP, Gater R, Sartorius N, Ustun TB, Piccinelli M, Gureje O, et al. The validity
27 of two versions of the GHQ in the WHO study of mental illness in general health care.
28 *Psychol Med*. 1997;
29
30
31 24. Goldberg DP, Oldehinkel T, Ormel J. Why GHQ threshold varies from one place to
32 another. *Psychol Med*. 1998;
33
34
35 25. Horowitz M, Wilner N, Alvarez W. Impact of event scale: A measure of subjective
36 stress. *Psychosom Med*. 1979;
37
38
39 26. Eysenbach G. Improving the Quality of Web Surveys: The Checklist for Reporting
40 Results of Internet E-Surveys (CHERRIES). *J Med Internet Res* [Internet]. 2004 Sep 29
41 [cited 2019 Oct 9];6(3):e34. Available from:
42
43 <http://www.ncbi.nlm.nih.gov/pubmed/15471760>
44
45
46 27. Smith J, Keating L, Flowerdew L, O'Brien R, McIntyre S, Morley R, et al. An Emergency
47 Medicine Research Priority Setting Partnership to establish the top 10 research
48 priorities in emergency medicine. *Emerg Med J*. 2017;
49
50
51 28. Marshall A, Altman DG, Holder RL, Royston P. Combining estimates of interest in
52 prognostic modelling studies after multiple imputation: Current practice and
53 guidelines. *BMC Med Res Methodol*. 2009;
54
55
56 29. M.H. H, J.B. C, J.A. S, K.J. L. A comparison of multiple imputation methods for missing
57 data in longitudinal studies. *BMC Med Res Methodol*. 2018;
58
59
60

- 1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
30. Grund S, Lüdtke O, Robitzsch A. Multiple Imputation of Missing Data for Multilevel Models. *Organ Res Methods* [Internet]. 2018 Jan 15 [cited 2020 Apr 23];21(1):111–49. Available from: <http://journals.sagepub.com/doi/10.1177/1094428117703686>
 31. von Hippel PT. 4. Regression with Missing Ys: An Improved Strategy for Analyzing Multiply Imputed Data. *Sociol Methodol* [Internet]. 2007 Aug 23 [cited 2020 Apr 23];37(1):83–117. Available from: <http://journals.sagepub.com/doi/10.1111/j.1467-9531.2007.00180.x>
 32. Godlee F. Covid-19: weathering the storm. *BMJ*. 2020 Mar 26;368:m1199.
 33. BMA survey finds doctors' lives still at risk despite PPE pledges [Internet]. [cited 2020 Apr 23]. Available from: <https://www.bma.org.uk/news-and-opinion/bma-survey-finds-doctors-lives-still-at-risk-despite-government-pledges-on-ppe>
 34. Holmes EA, O'Connor RC, Perry VH, Tracey I, Wessely S, Arseneault L, et al. Multidisciplinary research priorities for the COVID-19 pandemic: a call for action for mental health science. *The Lancet Psychiatry* [Internet]. 2020 Apr [cited 2020 Apr 17];0(0). Available from: <https://linkinghub.elsevier.com/retrieve/pii/S2215036620301681>
 35. Maunder RG, Lancee WJ, Balderson KE, Bennett JP, Borgundvaag B, Evans S, et al. Long-term psychological and occupational effects of providing hospital healthcare during SARS outbreak. *Emerg Infect Dis*. 2006;
 36. Arora M, Asha S, Chinnappa J, Diwan AD. Review article: Burnout in emergency medicine physicians. Vol. 25, *EMA - Emergency Medicine Australasia*. 2013. p. 491–5.
 37. Fiksenbaum L, Marjanovic Z, Greenglass ER, Coffey S. Emotional exhaustion and state anger in nurses who worked during the sars outbreak: The role of perceived threat and organizational support. *Can J Community Ment Heal*. 2006;
 38. Pilling S, Whittington C, Taylor C, Kendrick T. Identification and care pathways for common mental health disorders: Summary of NICE guidance. Vol. 342, *BMJ*. 2011.
 39. The psychological needs of healthcare staff as a result of the Coronavirus pandemic. | *BPS* [Internet]. [cited 2020 Apr 23]. Available from: <https://www.bps.org.uk/news-and-policy/psychological-needs-healthcare-staff-result-coronavirus-pandemic>

Acknowledgements

The views expressed are those of the authors and not necessarily those of the NHS, the NIHR, the Department of Health or the Royal Colleges involved in survey distribution.

The authors would like to acknowledge Mai Baquedano, at the University of Bristol, for her support with REDCap. The authors would finally like to acknowledge GL Assessments for providing the licence for the GHQ-12 free of charge.

Author Contributions

Tom Roberts (TR) conceived the idea for the study. TR, Edd Carlton (EC), Jo Daniels (JD), Mark Lyttle (ML), and Blair Graham (BG) were responsible for the initial study design, which was refined with the help of Katie Samuel (KS), Charles Reynard (CR), Robert Hirst (RH), Michael Barrett (MB) and William Hulme (WH). Expert advice on psychological assessment scores was provided by JD. WH provided the statistical plan. TR lead the dissemination of the study in UK Adult Emergency Departments (ED), ML lead the dissemination of the study in UK and Ireland Paediatric EDs, KS lead the dissemination of the study in UK Anaesthetic and ICU Departments, MB lead the dissemination of the study in Ireland EDs, ICUs and Anaesthetic Departments. TR coordinated study set-up, finalisation of the study surveys and finalisations of study protocols. All authors contributed to the final study design and protocol development, critically revised successive drafts of the manuscript and approved the final version. The study management group is responsible for the conduct of the study.

Funding

The Survey platform is provided courtesy of University of Bristol. The chief investigator is directly funded as a research fellow by the Royal College of Emergency Medicine. The GHQ-12 is being used under licence from GL assessments; the fee for use of this instrument within all three surveys has been waived. Dr Carlton is a National Institute for Health Research Advanced Fellow.

Competing Interests

Many of the authors have been working as frontline clinicians during the COVID-19 pandemic.

They have no competing interests to declare.

For peer review only

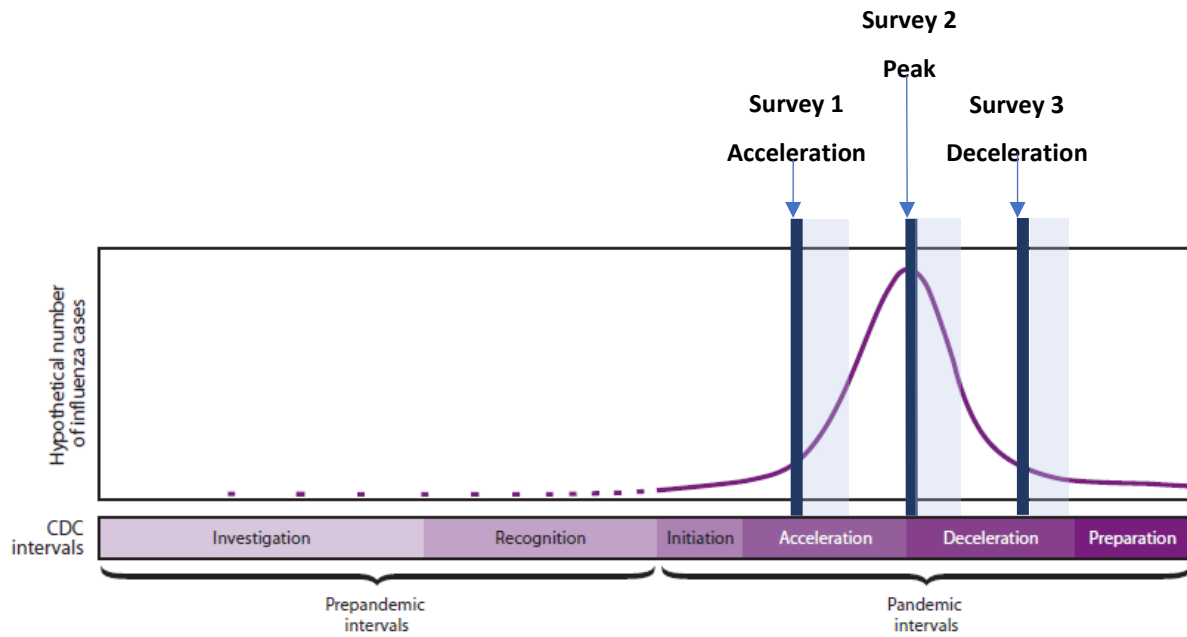


Figure 1. Timing of Surveys in accordance with pandemic preparedness model. Solid blue line represents date of survey issue, transparent blue area represents data collection period (As adapted from the CDC (21))

Peer review only

Online supplementary 1. CERA Survey 1 Questions

Field Label	Choices, Calculations, OR Slider Labels
Do you want to read the participant information sheet now?	
If you would like to download the patient information sheet to read later, please download the link below.	
By checking this box, I certify that I am at least 18 years old and that I give my consent freely to participate in this study.	1, I consent
What is your e-mail address? (This will only be used for the delivery of survey 2 + 3, which you will receive over the coming months)	
What is the name of the Hospital where you work?	
You have selected other, please specify.	
What is your professional grade?	17, GP Trainee 1, ST1 2, ST2 3, ST3 4, ST4 5, ST5 6, ST6 7, ST7 8, ST8 9, F1 10, F2 11, Clinical Fellow (F2-ST3 Level) 12, Clinical Fellow (>=ST4 Level) 13, Consultant 14, Associate Specialist 15, Staff Grade 16, CESR Doctor 18, GP 19, Other
You have selected other, please specify.	
What is your gender?	1, Male 2, Female 3, Other 4, Prefer not to say
How old are you?	1, 20-25 2, 26-30 3, 31-35 4, 36-40 5, 41-45 6, 46-50 7, 51-55 8, 56-60 9, 61-65 10, 66-70 11, >70
What is your 'parent speciality'?	1, Emergency Medicine 2, Anaesthetics 3, Intensive Care Medicine 9, Paediatrics 4, General Practice 5, Surgery 6, Foundation Programme 7, Acute Internal Medicine 8, Other
What is your 'parent speciality'?	1, Emergency Medicine 2, Anaesthetics 3, Intensive Care Medicine 9, Paediatrics 4, General Practice 5, Surgery 6, Foundation Programme 7, Acute Internal Medicine 8, Other
You have selected other, please specify.	
<div class="rich-text-field-label"><p>In what Department were you working as of March 1st 2020?</p></div>	1, Emergency Department (adult or paediatric) 2, Anaesthetic Department (adult or paediatric) 3, Intensive Care Department (adult or paediatric) 5, Acute Medical Unit 6, Hospital ward (adult or paediatric) 4, Other
<div class="rich-text-field-label"><p>In what Department were you working as of March 1st 2020?</p> <p>Select all that apply</p></div>	1, Emergency Department (adult or paediatric) 2, Anaesthetic Department (adult or paediatric) 3, Intensive Care Department (adult or paediatric) 5, Acute Medical Unit 6, Hospital ward (adult or paediatric) 4, Other
<div class="rich-text-field-label"><p>You selected other, in which Department where you working as of March 1st 2020?</p></div>	
Have you been deployed to a different clinical area as a result of the COVID-19 outbreak?	
Where have you been redeployed to?	1, Emergency Department (adult or paediatric) 2, Anaesthetic Department (adult or paediatric) 3, Intensive Care Department (adult or paediatric) 5, Acute Medical Unit 6, Hospital ward (adult or paediatric) 4, Other
You have selected other, please specify.	

How satisfied are you with this redeployment?	1, Very dissatisfied 2, Somewhat dissatisfied 5, Neither satisfied nor dissatisfied 3, Somewhat satisfied 4, Very satisfied
Have you previously provided direct clinical care to any patients affected by these infectious disease outbreaks? (please select all that apply)	0, None of the below 4, Ebola virus 10, MERS-CoV 16, SARS 1, Chikungunya 2, Cholera 6, Influenza (swine, avian, zoonotic) 20, Zika virus 21, Other
You have selected other, please specify.	
Been able to concentrate on whatever you're doing?	1, Better than usual 2, Same as usual 3, Less than usual 4, Much less than usual
Lost much sleep over worry?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
Felt that you are playing a useful part in things?	1, More so than usual 2, Same as usual 3, Less useful than usual 4, Much less useful
Felt capable of making decisions about things?	1, More so than usual 2, Same as usual 3, Less so than usual 4, Much less capable
Felt constantly under strain?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
Felt you couldn't overcome your difficulties?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
Been able to enjoy your normal day-to-day activities?	1, More so than usual 2, Same as usual 3, Less so than usual 4, Much less than usual
Been able to face up to your problems?	1, More so than usual 2, Same as usual 3, Less able than usual 4, Much less able
Been feeling unhappy and depressed?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
Been losing confidence in yourself?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
Been thinking of yourself as a worthless person?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
Been feeling reasonably happy, all things considered?	1, More so than usual 2, About the same as usual 3, Less so than usual 4, Much less than usual
<p><div class="rich-text-field-label"><p>For the above 12 questions the following applies: All rights reserved. This work may not be reproduced by any means, even within the terms of a Photocopying Licence, without the written permission of the publisher. Photocopying without permission may result in legal action. Published by GL Assessment Limited 1st Floor Vantage London, Great West Road, Brentford TW8 9AG This edition published 1992. GL Assessment is part of GL Education. www.gl-assessment.co.uk. David Goldberg, 1978 <strong style="font-family: Calibri, sans-serif; font-size: 14.666666984558105px;">General Health Questionnaire© (GHQ12).</p></div></p>	
Donning and doffing (gloves, gown, facemask, eye protection)	1, No training 2, Formal instructional video 3, Written instruction 4, Simulation training 5, Departmental guidance 6, Other
Formal fit testing for mask	1, No training 2, Formal instructional video 3, Written instruction 4, Simulation training 5, Departmental guidance 6, Other
PPE training for exposure to aerosol generating procedure (e.g. intubation)	1, No training 2, Formal instructional video 3, Written instruction 4, Simulation training 5, Departmental guidance 6, Other
Other. Please specify.	

If you have had any further PPE training please specify	
What practical education have you received in regards to the clinical care of patients presenting with suspected/diagnosed COVID-19?	0, None 1, Simulation training of a possible case 2, Simulation training of a case requiring aerosol procedure 3, Other
You selected other. Please specify.	
Government Guidance	1, Hourly 2, Up to twice a day 3, Daily 4, Several times a week 5, Weekly 6, Less than weekly 7, Never
College Guidance	1, Hourly 2, Up to twice a day 3, Daily 4, Several times a week 5, Weekly 6, Less than weekly 7, Never
Trust Guidance	1, Hourly 2, Up to twice a day 3, Daily 4, Several times a week 5, Weekly 6, Less than weekly 7, Never
Departmental guidance	1, Hourly 2, Up to twice a day 3, Daily 4, Several times a week 5, Weekly 6, Less than weekly 7, Never
Social Media	1, Hourly 2, Up to twice a day 3, Daily 4, Several times a week 5, Weekly 6, Less than weekly 7, Never
Online blogs and podcasts	1, Hourly 2, Up to twice a day 3, Daily 4, Several times a week 5, Weekly 6, Less than weekly 7, Never
Peer review literature	1, Hourly 2, Up to twice a day 3, Daily 4, Several times a week 5, Weekly 6, Less than weekly 7, Never
How confident do you feel in the infection control training that has been provided to you?	1, Not confident at all 2, Somewhat not confident 3, Somewhat confident 4, Very confident 5, Neither not confident or confident
How prepared do you feel to provide direct care to suspected cases?	1, Completely unprepared 2, Somewhat unprepared 3, Somewhat prepared 4, Very prepared 5, Neither unprepared or prepared
How do you feel the care received by patients who are NOT presenting with either symptoms or a diagnosis of COVID-19 is?	1, Significantly worse than before Covid-19 2, Slightly worse than before Covid-19 3, The same as before Covid-19 4, Slightly better than before Covid-19 5, Significantly better than before Covid-19
How many suspected cases of COVID-19 have you had direct clinical contact with since March 1st 2020?	0, 0 1, 1-5 2, 6-10 3, 11-15 4, 16-20 5, 21-25 6, 26-30 7, 31-35 8, > 36
As far as you are aware, how many of these suspected cases have turned out to be confirmed cases of COVID-19?	0, 0 1, 1-5 2, 6-10 3, 11-15 4, 16-20 5, 21-25 6, 26-30 7, 31-35 8, > 36
Are you concerned that the exposure to the COVID-19 outbreak may increase symptoms of any established medical health conditions?	0, Yes 1, No 2, Prefer not to disclose 3, I do not have an established medical condition
Are you concerned that the exposure to the COVID-19 outbreak may increase symptoms of any established mental health conditions?	0, Yes 1, No 2, Prefer not to disclose 3, I do not have an established mental health condition
I feel that my personal health is at risk during the COVID-19 outbreak due to my clinical role?	1, Strongly disagree 2, Disagree 3, Agree 4, Strongly agree 5, Neither agree nor disagree
How worried are you about the potential risks if you were to become infected with COVID-19?	1, Extremely worried 2, Generally worried 3, Generally not worried 4, Not worried at all 5, Neither worried or not worried
How worried are you about the potential risks to your family, loved ones or others due to your clinical role in the COVID-19 outbreak?	1, Extremely worried 2, Generally worried 3, Generally not worried 4, Not worried at all 5, Neither worried or not worried
Have you had to self-isolate?	
For what reason did you have to self-isolate?	1, Personal symptoms 2, Symptoms of a member of the household 3, Exposure to a positive case of COVID-19 in the work environment 4, Exposure to a positive case of COVID-19 in your personal environment 5, Personal diagnosis of COVID-19 6, Other (eg return from travel to high risk area)
Other - please specify	
How many clinical shifts in your rota have you missed due to self-isolation?	0, 0 1, 1 2, 2 3, 3 4, 4 5, 5-7 6, 8-10 7, >10

Date survey completed	
This is part 2 of the CERA survey. Thank you for taking the time to fill out the questions below.	
<div class="rich-text-field-label"><p>I have felt well supported by friends and family over the past two weeks (ie. since the national peak of the pandemic)?</p></div>	1, Strongly disagree 2, Disagree 5, Neither agree nor disagree 3, Agree 4, Strongly agree
<div class="rich-text-field-label"><p>I have felt well supported by colleagues over the past two weeks (ie. since the national peak of the pandemic) </p></div>	1, Strongly disagree 2, Disagree 5, Neither agree nor disagree 3, Agree 4, Strongly agree
<div class="rich-text-field-label"><p>During the COVID-19 pandemic, I have felt at personal high risk of dying/death?</p></div>	1, Yes 2, No
<div class="rich-text-field-label"><p>During the COVID-19 pandemic, I have witnessed the death of COVID-19 patients.</p></div>	1, Yes 2, No
<div class="rich-text-field-label"><p>Over the course of your life, have you experienced what you would characterise as a trauma?</p></div>	1, Yes 2, No
<div class="rich-text-field-label"><p>In the last two weeks I have experiences strong feelings of guilt, shame or helplessness as a consequence to my experience of working with COVID-19?</p></div>	1, Strongly disagree 2, Disagree 5, Neither agree nor disagree 3, Agree 4, Strongly agree
<div class="rich-text-field-label"><p>Have you had any loved ones receive intensive care treatment or die due to COVID-19 infection?</p></div>	1, Yes 2, No
<div class="rich-text-field-label"><p>Have you had any colleagues receive intensive care treatment or die due to COVID-19 infection?</p></div>	1, Yes 2, No
<div class="rich-text-field-label"><p>We should like to know if you have had any medical complaints, and how your health has been in general, over the past few weeks. Please answer ALL the questions simply by selecting the answer which you think most nearly applies to you. Remember that we want to know about present and recent complaints, not those you had in the past. It is important that you try to answer ALL the questions.</p></div>	
Been able to concentrate on whatever you're doing?	1, Better than usual 2, Same as usual 3, Less than usual 4, Much less than usual
Lost much sleep over worry?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
Felt that you are playing a useful part in things?	1, More so than usual 2, Same as usual 3, Less useful than usual 4, Much less useful
Felt capable of making decisions about things?	1, More so than usual 2, Same as usual 3, Less so than usual 4, Much less capable
Felt constantly under strain?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual

Felt you couldn't overcome your difficulties?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
Been able to enjoy your normal day-to-day activities?	1, More so than usual 2, Same as usual 3, Less so than usual 4, Much less than usual
Been able to face up to your problems?	1, More so than usual 2, Same as usual 3, Less able than usual 4, Much less able
Been feeling unhappy and depressed?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
Been losing confidence in yourself?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
Been thinking of yourself as a worthless person?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
Been feeling reasonably happy, all things considered?	1, More so than usual 2, About the same as usual 3, Less so than usual 4, Much less than usual
Below is a list of difficulties people sometimes have after stressful life events. Please read each item, and then indicate how distressing each difficulty has been for you DURING THE PAST SEVEN DAYS with respect to the PEAK of the COVID-19 pandemic that occurred on _____. How much have you been distressed or bothered by these difficulties?	
Any reminder brought back feelings about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I had trouble staying asleep	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
Other things kept me thinking about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I felt irritable and angry	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I avoided letting myself get upset when I thought about it or was reminded of it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I thought about it when I didn't mean to	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I felt as if it hadn't happened or wasn't real	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I stayed away from reminders of it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
Pictures about it popped into my head	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I was jumpy and easily startled	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I tried not to think about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I was aware that I still had a lot of feelings about it, but I didn't deal with them	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
My feelings about it were kind of numb	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I found myself acting or feeling like I was back at that time	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I had trouble falling asleep	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I had waves of strong feelings about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I tried to remove it from my memory	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60	<p>I had trouble concentrating</p> <p>Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea or a pounding heart</p> <p>I had dreams about it</p> <p>I felt watchful and on-guard</p> <p>I tried not to talk about it</p> <p>Any reminder brought back feelings about it?</p> <p>I had trouble staying asleep</p> <p>Other things kept me thinking about it</p> <p>I felt irritable and angry</p> <p>I avoided letting myself get upset when I thought about it or was reminded of it</p> <p>I thought about it when I didn't mean to</p> <p>I felt as if it hadn't happened or wasn't real</p> <p>I stayed away from reminders of it</p> <p>Pictures about it popped into my mind</p> <p>I was jumpy and easily startled</p> <p>I tried not to think about it</p> <p>I was aware that I still had a lot of feelings about it, but I didn't deal with them</p> <p>My feelings about it were kind of numb</p> <p>I found myself acting or feeling like I was back at that time</p> <p>I had trouble falling asleep</p> <p>I had waves of strong feelings about it</p> <p>I tried to remove it from my memory</p> <p>I had trouble concentrating</p> <p>Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea or a pounding heart</p> <p>I had dreams about it</p> <p>I felt watchful and on-guard</p>	<p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p> <p>1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely</p>
---	---	--

I tried not to talk about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
On average, how many pills did you take each day last week?	0, Less than 5 1, 5-10 2, 6-15 3, Over 15
Using the handout, which level of dependence do you feel you are currently at?	0, 0 1, 1 2, 2 3, 3 4, 4 5, 5
The choices you made	1, Not satisfied at all 2, Somewhat dissatisfied 3, Indifferent 4, Somewhat satisfied 5, Very satisfied
Your life overall	1, Not satisfied at all 2, Somewhat dissatisfied 3, Indifferent 4, Somewhat satisfied 5, Very satisfied
Your job	1, Not satisfied at all 2, Somewhat dissatisfied 3, Indifferent 4, Somewhat satisfied 5, Very satisfied
Your family life	1, Not satisfied at all 2, Somewhat dissatisfied 3, Indifferent 4, Somewhat satisfied 5, Very satisfied

Online Supplementary 2 Ethical Approval

Received 16th March 2020

This Ethics Form has now been signed off by the HoD.

Please click [here](#) to open **Fom No: 4421**

No further action is required. To see all the forms signed off, please click on the link above.

Please click [here](#) to view **All your Approved Ethics Forms.**

If you require any assistance or need to report a technical fault or issue with the form please refer to the following contact details:

Ethics Form: Technical Issues, Procedures & Suggestions:- ethics@lists.bath.ac.uk

Ethics Form: Urgent Technical Issues: c.j.cooper@bath.ac.uk



Children's Health Ireland
at Crumlin

Stáinte Leanaí Éireann (SLÉ) ag Cromghlinn, D12 N512, Éire
Children's Health Ireland (CHI) at Crumlin, D12 N512, Ireland
T + 353 (0) 1 409 6100 | F + 353 (0) 1 455 8873 | www.olchc.ie
Cosc ar úsáid d'oidis leighis | Not for prescription purposes

ETHICS (MEDICAL RESEARCH) COMMITTEE OFFICE

Tel: +353 (01) 409 6307/6243

A/Professor Michael Barrett
Consultant in Paediatric Emergency Medicine
Children's Health Ireland (CHI) at Crumlin
Dublin D12 N512

24th March 2020

REC Reference: GEN/806/20

The COVID-19 Emergency Response Assessment Survey
Principal Investigator: A/Professor Michael Barrett

Dear Professor Barrett

The Ethics (Medical Research) Committee at this hospital reviewed and approved the above Study.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Claire Rice'.

Claire Rice
Secretary
Ethics (Medical Research) Committee

Online Supplementary 3. HRA and Health and Care Research Wales, Approval



Ymchwil Iechyd
a Gofal Cymru
Health and Care
Research Wales



Dr Tom Roberts
TERN Fellow
Royal College of Emergency Medicine
7-9 Bream Buildings
London
EC4A 1DT

Email: approvals@hra.nhs.uk
HCRW.approvals@wales.nhs.uk

18 March 2020

Dear Dr Roberts

**HRA and Health and Care
Research Wales (HCRW)
Approval Letter**

Study title: COVID-19 Emergency Response Assessment (CERA)
IRAS project ID: 281944
Protocol number: Protocol 1.
REC reference: 20/HRA/1500
Sponsor North Bristol NHS Trust

I am pleased to confirm that [HRA and Health and Care Research Wales \(HCRW\) Approval](#) has been given for the above referenced study, on the basis described in the application form, protocol, supporting documentation and any clarifications received. You should not expect to receive anything further relating to this application.

Please now work with participating NHS organisations to confirm capacity and capability, [in line with the instructions provided in the "Information to support study set up" section towards the end of this letter.](#)

How should I work with participating NHS/HSC organisations in Northern Ireland and Scotland?

HRA and HCRW Approval does not apply to NHS/HSC organisations within Northern Ireland and Scotland.

If you indicated in your IRAS form that you do have participating organisations in either of these devolved administrations, the final document set and the study wide governance report (including this letter) have been sent to the coordinating centre of each participating nation. The relevant national coordinating function/s will contact you as appropriate.

BMJ Open

The COVID-19 Emergency Response Assessment Study; a prospective longitudinal survey of frontline Doctors in the UK and Ireland: Study Protocol

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2020-039851.R1
Article Type:	Protocol
Date Submitted by the Author:	25-Jun-2020
Complete List of Authors:	Roberts, Tom; The Royal College of Emergency Medicine, Daniels, Jo; University of Bath Hulme, William Horner , Daniel; The Royal College of Emergency Medicine; Salford Royal Hospitals NHS Trust, Department of Intensive Care Lyttle, Mark; Bristol Royal Hospital for Children, Emergency Department; University of the West of England, Faculty of Health and Applied Science Samuel, Katie; North Bristol NHS Trust, Department of Anaesthesia Graham, Blair; University of Plymouth; Plymouth Hospitals NHS Foundation Trust, Emergency Department Hirst, Robert; North Bristol NHS Trust, Department of Anaesthesia Reynard, Charles ; The University of Manchester Barrett, Michael; University College Dublin Carlton, Edward; North Bristol NHS Trust, Emergency Department; The Royal College of Emergency Medicine
Primary Subject Heading:	Mental health
Secondary Subject Heading:	Emergency medicine, Anaesthesia, Intensive care, Infectious diseases
Keywords:	ACCIDENT & EMERGENCY MEDICINE, ANAESTHETICS, INTENSIVE & CRITICAL CARE, PSYCHIATRY

SCHOLARONE™
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Title Page

The COVID-19 Emergency Response Assessment Study; a prospective longitudinal survey of frontline Doctors in the UK and Ireland: Study Protocol

Short Title

The CERA Study

Tom Roberts^{1, 2}, Jo Daniels³, William Hulme⁴, Daniel Horner^{2, 5, 11}, Mark D Lyttle^{6, 7}, Katie Samuel⁸, Blair Graham^{9, 10}, Robert Hirst⁸, Charles Reynard¹¹, Michael J Barrett^{12, 13, 14} and Edward Carlton^{1, 2} on Behalf of TERN, PERUKI, RAFT, ITERN and SATARN

Corresponding Author: Dr Tom Roberts, Tomkieranroberts@gmail.com, 07894234121, 12 Hamilton Road, Bristol, BS3 1PB

Affiliations:

- 1) Emergency Department, North Bristol NHS Trust, Bristol, UK.
- 2) Royal College of Emergency Medicine, London, UK
- 3) Department of Psychology, University of Bath, UK
- 4) Centre for Health Informatics, University of Manchester, UK
- 5) Department of Intensive Care and Emergency Department, Salford Royal Hospital NHS Trust
- 6) Emergency Department, Bristol Royal Hospital for Children, UK
- 7) Faculty of Health and Applied Sciences, University of the West of England, Bristol
- 8) Department of Anaesthesia, North Bristol NHS Trust, UK
- 9) University of Plymouth
- 10) Emergency Department, University Hospitals Plymouth, UK
- 11) University of Manchester
- 12) Department of Emergency Medicine, Children's Health Ireland at Crumlin, Ireland
- 13) School of Medicine, Women's and Children's Health, University College Dublin, Ireland
- 14) Irish Association of Emergency Medicine, Ireland

Word Count: 4708

Abstract

Introduction

The COVID-19 pandemic is putting an unprecedented strain on healthcare systems globally. The psychological impact on frontline doctors of dealing with the COVID-19 pandemic is currently unknown. This longitudinal professional survey aims to understand the evolving and cumulative effects of working during the COVID-19 outbreak on the psychological wellbeing of doctors working in Emergency Departments (ED), Intensive Care Units (ICU) and Anaesthetics during the pandemic.

Methods and Analysis

This study is a longitudinal questionnaire-based study with three pre-defined time points spanning the acceleration, peak, and deceleration phases of the COVID-19 pandemic. The primary outcomes are psychological distress and post-trauma stress as measured by the General Health Questionnaire-12 (GHQ-12) and Impact of Events Scale-Revised (IES-R). Data related to personal and professional characteristics will also be collected. Questionnaires will be administered prospectively to all doctors working in ED, ICU and Anaesthetics in the UK and Ireland via existing research networks during the sampling period. Data from the questionnaires will be analysed to assess the prevalence and degree of psychological distress and trauma, and the nature of the relationship between personal and professional characteristics and the primary outcomes. Data will be described, analysed and disseminated at each time point; however, the primary endpoint will be psychological distress and trauma at the final time point.

Ethics and Dissemination

Ethical approval was obtained from University of Bath, UK (ref:4421), and Children's Health Ireland at Crumlin, Ethics Committee. Regulatory approval from the Health Regulation Authority (UK), Health and Care Research Wales (IRAS: 281944).

This study is limited by the fact it focuses on Doctors only and is survey based without further qualitative interviews of participants. It is expected this study will provide clear

1
2
3 evidence of the psychological impact of COVID-19 on Doctors and will allow present and
4 future planning to mitigate against any psychological impact.
5
6
7

8
9 Registration Details –

10
11 ISRCTN: 10666798
12
13

14 Article Summary

15 16 Strengths and Limitations of this Study

- 17
18 • This longitudinal study will assess psychological wellbeing in frontline doctors, at
19 three time points across the pandemic wave, providing novel data in this potentially
20 at-risk group
21
22
- 23
24 • Both the GHQ-12 and IES-R have both been previously used in infectious disease
25 outbreaks to measure psychological distress and trauma response
26
27
- 28
29 • Collection of data at the 'peak' phase, capturing the degree of distress and personal
30 and professional factors associated with distress at a prime timepoint of maximal
31 stress upon frontline doctors.
32
- 33
34 • Pre-determined data collection points are reliant on national reporting and may not
35 accurately reflect local or regional variations in systems pressure.
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Introduction

Severe Acute Respiratory Syndrome Virus Covariant 2 (SARS-CoV-2) is a presumed zoonotic novel coronavirus that first emerged in the province of Hubei, China during late 2019. [1] Viral transmission is presumed to be via droplet spread and it multiplies in respiratory epithelium. Clinical manifestations of the resulting COVID-19 disease include bilateral interstitial pneumonia, acute respiratory distress syndrome, and multi-organ dysfunction syndrome. [2] Due to high transmissibility, hospitalisation rates, critical care requirements and mortality rate in elderly and vulnerable populations, COVID-19 has created a public health emergency, [3] and was declared a pandemic by the World Health Organisation on the 11th March 2020. [4]

Clinicians in acute and critical healthcare services provide medical care at the point of highest risk of disease transmission, and frequently undertake aerosol generating procedures which increase their exposure to SARS-CoV-2. During comparable infectious disease outbreaks such as SARS-CoV and Ebola, healthcare workers were over-represented in disease incidence and poor clinical outcomes. Such concerns relating to COVID-19 are reflected in experiences anecdotally reported from the international healthcare community. [5]

This study will focus on Doctors and not the wider healthcare workforce. It is well documented that other professions are potentially impacted more by infectious disease outbreaks and by COVID-19. [6] Discussions were held between the study team and representatives from the Royal College of Nursing UK and College of Paramedics UK about a combined study. It was agreed that due to the limited timescale to collect data during the acceleration phase and complexities around different working practices that delaying data collection to involve a wider cohort would threaten the viability of the study. This protocol was shared with the Colleges to support their independent studies, as well as ongoing information sharing to support study implementation.

In the UK and Ireland, doctors working in Emergency Departments (ED), Intensive Care Units (ICU) and Anaesthetics will be responsible for the initial identification, management and ongoing treatment of patients presenting with COVID-19. In addition, many difficult decisions

1
2
3 relating to treatment escalation and resource allocation for individual patients will be made
4 by clinicians working in these key areas. Many doctors are likely to be redeployed to these
5 clinical areas or asked to work beyond their level of seniority. In addition, these doctors are
6 likely to be directly responsible for the care of colleagues and staff members with the
7 infection.
8
9
10
11
12

13
14 Resources in these clinical areas are already stretched at baseline. Operational pressures
15 within EDs, critical care settings and emergency anaesthetic provision have been severe and
16 escalating over a period of many years. This is reflected in the time to complete care episodes
17 and health outcomes [7], the impact of fatigue and burnout within anaesthesia and ICU
18 training [8] and the UK and Ireland having some of the lowest numbers of critical care beds
19 per 100,000 of population in Europe. [9] This has resulted in concerns regarding surge
20 capacity of facilities to cope with a pandemic illness. [10] The psychological, emotional and
21 physical demands placed on an already overstretched workforce may therefore be
22 substantial.
23
24
25
26
27
28
29
30

31
32 It is evident from a substantial body of research across disaster settings that there is often a
33 significant and long-lasting negative impact on the psychological wellbeing of clinicians
34 involved. [11,12] Similar themes are also emerging from the COVID-19 pandemic in a cross-
35 sectional survey undertaken in selected healthcare workers in China. [6]
36
37
38
39
40

41 Key factors in predicting psychological distress post trauma span a range of domains and
42 include preparedness and training, [13–15] social and occupational support, [13–16], risk
43 exposure and threat to life, [14,16,17] self-isolation, [14,16,18] media use [19,20] negative
44 affect following exposure, [14,16–18] history of mental health problems and previous
45 trauma. [15,17,18] Yet, these have largely been identified post-hoc, in the aftermath of
46 events and without prospective data collection or a comprehensive understanding of the
47 relative impact of these factors as an event unfolds.
48
49
50
51
52
53
54

55
56 To date, no large-scale longitudinal studies have proposed to prospectively examine the
57 psychological distress and trauma response in clinicians during the acceleration, peak and
58 deceleration phase of the pandemic wave of COVID-19. This study aims to understand the
59
60

1
2
3 evolving and cumulative effects of working in EDs, ICUs and Anaesthesia during the COVID-19
4 outbreak, specifically seeking to understand key personal and professional factors which
5 predict psychological distress in this cohort of frontline doctors.
6
7
8
9

10 Methods and Analysis

11
12
13 The primary aim of this study is to assess the prevalence and degree of psychological distress
14 and trauma in doctors providing frontline care during the acceleration, peak, and deceleration
15 phases of the COVID-19 pandemic, and furthermore establish which personal and
16 professional factors are associated with psychological distress at these time points.
17
18
19

20
21
22 More specifically, the objectives are to:

- 23 1. Evaluate personal and professional factors contributing to psychological wellbeing at
24 the acceleration, peak, and deceleration phase of the pandemic
- 25 2. Establish the incidence of self-reported COVID-19 infection and self-isolation amongst
26 frontline doctors, and to evaluate any association with psychological wellbeing
- 27 3. Assess regional and national variation of psychological distress and trauma in doctors
28 within the UK and Republic of Ireland
29
30
31
32
33
34
35
36
37

38 Study Design and Conduct

39
40 This prospective online longitudinal survey consists of three phases commensurate with the
41 fluctuation of an initial pandemic wave of COVID-19 in the UK and Ireland. More specifically:
42
43
44

- 45 • Phase 1: Acceleration Survey; administered at 0 months (March 2020)
- 46 • Phase 2: Peak Survey; administered on day 7 following the pandemic peak, as defined
47 by COVID-19 related hospital deaths, in the UK and Ireland
- 48 • Phase 3: Deceleration Survey; administered 30 days following the peak survey.
49
50
51
52
53

54 These three phases have been adapted from the Centre for Disease Control (CDC)
55 “Preparedness and Response Framework for Influenzae Pandemics”(Figure 1). [21]
56
57
58
59
60

1
2
3
4
5 *Figure 1. Timing of Surveys in accordance with pandemic preparedness model. Solid blue line represents date of survey*
6 *issue, transparent blue area represents data collection period (As adapted from the CDC [21])*
7
8
9

10 Outcome Measures

11
12
13 The co-primary outcome measures will be GHQ-12 scores from Phase 1, 2 and 3 surveys, and
14 the IES-R score in Phase 2 and 3 surveys.
15
16

17
18
19 The General Health Questionnaire - 12 (GHQ-12) [22] is a brief, validated, 12 item self-
20 report measure devised to screen for psychological distress in the general population. It
21 assesses current state (rather than long-standing attributes) and asks the participants to
22 compare to usual state. The measure has high specificity and sensitivity, with reliability
23 demonstrated across a range of cultures and populations. [23] The GHQ-12 has been used in
24 similar clinician-based studies measuring the psychological impact of infectious outbreaks
25 [14] and was chosen due to the brevity of the measure and its suitability for time pressured
26 medical staff. The GHQ-12 can be scored using several methods and we will report 2 of
27 these in our results. The first, the 0-0-1-1 scoring method, is the most commonly utilised,
28 and has the highest sensitivity and specificity overall. [23] This method has an established
29 clinical cut-off of > 3 which we will use to calculate prevalence of case level psychological
30 distress in our study sample. [23–25] The second uses a 0-1-2-3 scoring method which
31 is sensitive to changes across time points, however unlike the first method, there is no
32 established cut-off and this technique reflects degree of distress rather than threshold
33 caseness. We will use this method to detect within-person changes within our sample. By
34 presenting the two different scoring methods we can both report the prevalence of case
35 level distress across the sample (0-0-1-1 scoring method) and detect changes within the
36 sample over the three phases of the pandemic (0-1-2-3 scoring method).
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54

55 The Impact of Events Scale - Revised (IES-R) [26] is a 22 item measure commonly used to
56 measure post-traumatic stress following a pre-specified traumatic incident. Items are scored
57 on a Likert scale, ranging from 0 representing 'not at all' to 4 representing 'extremely'. The
58
59
60

IES-R has been commonly used in infectious disease outbreaks to assess post-traumatic stress in hospital staff. [14] The IES-R has three subscales, relating to intrusion, avoidance and hyperarousal. Responses will be analysed similarly to the GHQ-12, assigning the responses as 0, 1, 2, 3, 4 (positive to negative) producing a score in the range 0 to 88. A score of 24 or above will indicate a clinically significant stress response.

Secondary outcome measures will be pre-defined personal and professional characteristics (Table 1) and their association with psychological distress as defined by GHQ-12 and IES-R.

Table 1 – Personal and Professional Questions

Demographic Data	Survey.1	Survey.2	Survey.3
Age	✓		
Gender	✓		
Ethnicity		✓	
Employment related factors	Survey.1	Survey.2	Survey.3
Name of Hospital	✓		
Parent Speciality	✓		
Type of Department	✓		
Redeployed to another clinical area	✓	✓	
Where have you been redeployed to	✓	✓	
How satisfied are you with this redeployment	✓	✓	
Deployment back to original place of work			✓
Local availability of psychological support		✓	✓
Training and experience	Survey.1	Survey.2	Survey.3
Previous infectious disease experience	✓		
Exposure to suspected/confirmed cases of COVID-19	✓	✓	✓
Exposure to patients who have died due to suspected or confirmed COVID-19		✓	✓
Personal Protective Equipment Training	✓	✓	
Confidence in Personal Protective Equipment Training	✓	✓	✓
COVID-19 practical clinical care training and confidence	✓	✓	✓
Frequency of access and sources of clinical information	✓	✓	
Perception of preparedness	✓	✓	✓
Personal factors	Survey.1	Survey.2	Survey.3
Concern regarding worsening of mental health condition	✓	✓	✓

Concern regarding worsening of physical health condition	✓	✓	✓
Concerns about risk to personal health	✓	✓	✓
Concerns about risk to family or loved ones	✓	✓	✓
Experience of previous significant trauma (prior to COVID-19 pandemic)		✓	✓
Concern about risk of death to self		✓	✓
Perception of support from friends and family		✓	✓
Perception of support from senior leadership team		✓	✓
Perception of impact on other patient groups (not COVID-19)	✓	✓	✓
Positive factors related to involvement with Coronavirus response		✓	✓
Personal experience of COVID-19	Survey.1	Survey.2	Survey.3
Have you had to self-isolate	✓	✓	✓
Reason for self-isolation	✓	✓	✓
Number of clinical shifts missed due to self-isolation	✓	✓	✓
Have you received a positive Coronavirus diagnosis		✓	✓
Have you been admitted to hospital due to Coronavirus		✓	✓
Have you received an antibody test			✓
What was the result of the antibody test			✓
Any COVID-19 related illness or death in family or friends		✓	✓
Any COVID-19 related illness or death in colleagues		✓	✓

Participants

Frontline medical staff employed in their main role as a doctor in the ED, ICU or Anaesthetics in the UK and Ireland at the point of study commencement will be invited to participate. All grades of medical staff will be eligible to participate.

Doctors who move clinical setting between surveys will not be excluded, provided they remain within an acute trust setting. Doctors whose main place of employment at the point of study commencement is not the ED, ICU or Anaesthetics and Non-doctors working in ED, ICU or Anaesthetics will be excluded. Participants will be asked to declare the hospital they work in. Hospitals will be grouped into regions as defined by UK Government Coronavirus death reporting. [27]

Survey Distribution

All potential participants will be invited to participate in the Phase 1 survey through established acute care research networks: in Emergency Medicine, members of the Trainee Emergency Research Network (TERN), Irish Trainee Emergency Research Network (I-TERN), Irish Association of Emergency Medicine and Paediatric Emergency Research in the UK and Ireland (PERUKI) will be invited to register as participating sites via institutional email and instant messaging groups. A site lead will be identified in each centre who will be responsible for distributing the participation link for Phase 1 Survey and encouraging participation through the display of relevant materials. In order to mitigate against non-UK or Ireland doctors and other healthcare groups completing the survey, the participation link will not be shared on wider social media platforms.

In the fields of Intensive Care and anaesthesia, participants will be invited to complete the Phase 1 Survey via the UK Research and Audit Federation of Trainees (RAFT) network membership groups and the Irish Specialist Anaesthesiology Trainee Audit & Research Network (SATARN) via email and instant messaging. Additionally, participation invitations will be disseminated by the Royal College of Anaesthetists, College of Anaesthesiologists of Ireland and National Institute of Health Research (NIHR) Clinical Research Networks (including Trauma and Emergency Care, Critical Care and Anaesthesia & perioperative medicine) via email to regional leads, with additional invitations to all UK anaesthetists via the Lifelong Learning Platform. The Trainee Research in Intensive Care network (TRIC) will also distribute the survey link amongst their members and through the Faculty of Intensive Care Medicine (FICM).

Survey Design

The survey has been designed and managed in line with the Checklist for Reporting Results of Internet E-surveys (CHERRIES) guidelines. [28]

A summary of survey construction is outlined in Table 2. Each survey was developed iteratively by the study team and underpinned by evidence where available, or by consensus where necessary. Literature reviews were performed to identify factors with potential impact on psychological distress and trauma. Psychometric tools were selected by consensus of the study team, considering validity and utility of a range of measures, balanced against the feasibility of delivery and completion by individuals likely to be working at maximum capacity. Each survey will be piloted by members of the study team prior to full release.

Study Phase	Survey	Characteristics						Psychometric Evaluation	
		Informed Consent	Basic Demographic Data	Employment Related Data	Training and Experience Data	Personal factors	Personal Experience of COVID-19	Psychological Wellbeing	Trauma Response
								GHQ12 ¹	IESR ²
Acceleration	1	✓	✓	✓	✓	✓	✓		
Peak	2	✓	-	✓	✓	✓	✓	✓	
Deceleration	3	✓	-	✓	✓	✓	✓	✓	
		¹ General Health Questionnaire ² Impact of Events Scale- Revised							

Table 2: Study design summary table

1 *Phase 1: Acceleration Survey*

2 Phase 1 survey (Online Supplementary 1) will gather consent and contact e-mail address,
3 selected personal and professional characteristics and responses to the GHQ-12 survey.

4 *Phase 2: Peak Survey*

5 All participants who completed the Phase 1 survey will be invited via the REDCap invite
6 function to complete Phase 2 and 3 surveys. This uses a secure institutional email to deliver
7 email invitations. The Phase 2 Survey will gather consent and additional demographic,
8 experiential or work-related data. No additional personal identifiable information will be
9 taken. Participants will be requested to complete a serial evaluation of GHQ-12 and the IES-
10 R; these are both valid and reliable short-form measures of their original counterparts and
11 are used in order to limit participant fatigue.

12 *Phase 3: Deceleration Survey*

13 Phase 3 Survey will gather consent and further data on personal and professional factors. No
14 additional personal identifiable information will be taken, and it will be ensured that the
15 survey does not exceed a reasonable length, to limit participant fatigue. Participants will be
16 requested to complete a serial evaluation of GHQ-12 and IES-R.

17 *Survey Timeline*

18 *Identification of pandemic phases to guide survey release*

19 The surveys will be released in-keeping with the CDC pandemic framework outlined in Figure
20 1. As the current outbreak is dynamic by its very nature, the exact timings of the peak and
21 deceleration phases are uncertain but will be identified using the below criteria.

22 *Identification of Acceleration Phase*

23 The authors reached a consensus decision on 17th March 2020, based on best available
24 evidence from Public Health England (PHE) that the UK was in the 'acceleration phase' of the

1 current COVID-19 outbreak. Phase 1 survey was opened on March 18th 2020, for a period of
2 ten days.

4 *Identification of Peak Phase*

5 The authors will hold regular remote meetings to monitor the evolving COVID-19 outbreak.
6 The 'Peak' survey will be released 7-days after the *first* UK and *first* Republic of Ireland
7 national peaks of COVID-19 related deaths. The 7-day time delay is due to the requirement of
8 the IES-R scale to reflect on feelings over the last 7-days, thus a delay will ensure answers
9 more accurately represent true outcomes from the pandemic peak. Nationally reported death
10 rates have been chosen rather than confirmed cases due to a lack of consistency in screening
11 and reporting of confirmed cases in the UK and Ireland. As UK national death rates are publicly
12 available, in comparison to regional death rates, it is recognised that regional variation may
13 occur.

15 The UK and Republic of Ireland national peaks will be decided by a consensus decision of the
16 Study Management Group, which will be recorded and documented in the final study
17 report. The consensus decision will be guided by:

- 18 • Publicly available COVID-19 daily death rates data from PHE (accessed via:
19 <https://coronavirus.data.gov.uk>) and Ireland's Department of Health (accessed via:
20 <https://www.gov.ie/en/news/7e0924-latest-updates-on-covid-19-coronavirus/>)
- 21 • Government daily briefings
- 22 • Published modelling literature

24 The survey will remain open for 14 days to ensure maximal response rates.

26 *Identification of Deceleration Phase*

27 The deceleration phase is defined by the CDC as "consistently decreasing rate of cases". [21]
28 To ensure the deceleration survey is released during this phase, it will be released 30 days
29 after the administration of the 'Peak' Survey. This is to ensure UK and Republic of Ireland

1 cases are consistently decreasing and that there is no evidence of a second peak. The survey
2 will remain open for 21 days.

3

4 **Informed Consent**

5 Electronic informed consent will be obtained prior to completion of each round of the
6 surveys.

7

8 **Withdrawal**

9 Participants can exit the survey online if they no longer wish to take part at any time.
10 However, it will be clear in the introductory statement that data from questions already
11 completed may be analysed.

12

13 **Administration**

14 The survey will be administered via the online platform REDCap. (16) This electronic data
15 capture platform is fully compliant with Good Clinical Practice, 21 CFR Part 11, GDPR, 20 ISO
16 27001 and ISO 9001.14. It has stringent data security procedures and uses private servers.
17 Data will be held securely on secure online server hosted by the University of Bristol, UK.

18

19 **Patient and Public Involvement**

20 Staff wellbeing was rated the fourth highest priority of the James Lind Alliance Priority Setting
21 Partnership, [29] which involved extensive consultation with clinicians, patients, public and
22 carers. This study does not directly involve patients; however, the potential impact that
23 psychological trauma in doctors could have for patient care is concerning. Due to the urgency
24 and unprecedented nature of the current situation, patient and public involvement directly
25 related to this study has not been possible during the development of this protocol. It was
26 felt inappropriate to seek stakeholder engagement from doctors over the short study
27 development period as it could have detracted from pressing clinical demands.

28

1 Statistical Analysis Plan

2 Response Rate

3 This will be presented using the CHERRIES checklist specifications. (12) An overall response
4 rate denominator will be reported using data provided by the General Medical Council (GMC)
5 on doctors currently registered and working in ED, Anaesthetics and ICU in the UK. Estimates
6 on the denominator for participants from Ireland will be reported using data provided by
7 individual hospital departments on doctors working in the ED, Anaesthetics and ICU.

9 Analysis cohort (inclusion / exclusion criteria)

10 Non-consented, duplicate (by email address) and non-completion of the minimum required
11 dataset for analysis (completion of GHQ-12, grade and hospital) will be excluded. Duplicates
12 are handled as follows: where two or more email addresses are present, the most complete
13 survey will be taken. Note that a complete survey may include unanswered questions.

14 The primary analysis cohort will comprise participants who have completed the GHQ-12 in
15 all 3 surveys and the IES-R in surveys 2 and 3. Sub-analyses of completed surveys 1, 2, and 3,
16 irrespective of completion of other survey, will also be reported.

17
18 Due to the difference in COVID-19 related policy between the Governments of the UK and
19 Republic of Ireland, there may be a difference in timing of the pandemic wave. This could
20 result in a significant difference of the study populations. Therefore, a study management
21 group decision will be made, prior to final analysis, in regard to whether the difference of
22 timing of the UK and Republic of Ireland's pandemic waves precludes joint analysis. Any
23 decision will be documented in the final study report.

25 Descriptive Statistics

26 Descriptive statistics relating to participants' personal and professional characteristics will be
27 presented overall and by department/geographic region.

1 GHQ-12 items will be analysed both individually and aggregated into an overall score using
 2 the 0-1-2-3 method. This method assigns responses to 0, 1, 2, 3 (positive to negative
 3 sentiment) producing a score in the range 0 to 36, with zero representing the most healthy
 4 response and 36 the most unhealthy. Note that for case identification, the 0-0-1-1 method
 5 is used (see outcome measures and Table 3).

6
 7 IES-R responses will be analysed similarly, by assigning the responses to 0, 1, 2, 3, 4 (positive
 8 to negative) producing a score in the range 0 to 60.

9
 10 The distribution of GHQ-12 and IES-R scores will be presented graphically, with an appropriate
 11 measure of central tendency and variation provided. Comparisons between different
 12 personal and professional characteristics will also be made. Distributional (median, Q1, Q3)
 13 and mean differences will be reported. Proportions of respondents meeting thresholds of
 14 clinically significant impairment will be derived for each of the psychometric measures, as
 15 outlined in Table 3.

16
 17 These descriptive analyses will be performed for the primary analysis cohort and the survey-
 18 specific sub-cohorts. Participant dropout rates from survey one to surveys two and three will
 19 be reported.

20
 21 **Table 3 – Threshold scores for the GHQ-12 and IES-R**

	Thresholds for clinical significance of each of the psychometric evaluations
GHQ-12 General Function	<ul style="list-style-type: none"> Above 3 on the 0-0-1-1 scoring system represents case level psychological distress
IES-R Trauma	<ul style="list-style-type: none"> 24 or above on the 0-1-2-3-4 scoring system represents clinically significant stress response

22
 23
 24 **Inter-survey analysis**

25 The models outlined are descriptive, with model parameters intended to summarise
 26 observed statistical relationships rather than estimating underlying causal effects. No formal

1 null hypothesis significance testing will be performed to determine the presence or absence
2 of statistically significant effect sizes, though p-values for model estimates will be reported
3 for reference.

4 5 *Change in the GHQ-12-score*

6 The change over time in the GHQ-12 score amongst participants who responded to all three
7 surveys will be examined. Graphical relationships between the trend in the GHQ-12 score and
8 variables collected at Phase 1 Survey will be presented.

9
10 A repeated measures non-linear mixed effect model will be deployed. The dependent
11 variable, GHQ score as measured on three consecutive occasions, is indexed either by
12 survey response date (in continuous-time) or by survey epidemic phase (before, during, and
13 after the epidemic peak). Models based on both indices will be investigated.

14 For the time-indexed model, a quadratic relationship between time and GHQ will be
15 permitted (given the potential for a rise then fall in GHQ-12 over the course of the
16 epidemic).

17
18 Region-level random-effects on the intercept and time will be included in both time- and
19 phase-indexed models, enabling regional differences in the modelled effect of phase/time
20 on GHQ and IES-R scores to be (partially) accounted for. Hospital-level random effects may
21 also be investigated, depending on the number of responses per hospital. Whilst hospital-
22 level random effects would more appropriately account for between-hospital heterogeneity
23 than region-level random effects, it is anticipated that some hospitals will only be
24 represented by only a very small number of participants, which may cause problems for
25 model identification.

26
27 To identify potential modifiers of GHQ-12-score change, further models each with a single
28 additional covariate will be built, with the likelihood ratio used to assess the degree of
29 improvement in the model.

30

1 *Impact of Events Scale-Revised*

2 The IES-R score amongst participants who responded to all three surveys will be examined.
3 Graphical relationships between the IES-R score and variables collected at survey 1 will be
4 presented.

5
6 A linear model will be deployed seeking to account for the variation in the IES-R score with
7 survey 1 variables.

8
9 To identify potential pre-peak modifiers of IES-R-score (for instance to identify characteristics
10 that put clinicians at higher risk of trauma following an epidemic), further models each with
11 a single additional covariate will be built, and a likelihood ratio test performed to assess the
12 improvement in the model. For phase 3 models, the IES-R score from phase 2 will also be
13 included as a covariate.

14 15 **Procedure for accounting for missing, unused and spurious data**

16 Information on completeness for each variable will be reported. For the primary models,
17 missing values will be imputed using multi-level fully conditional specification multiple
18 imputation with 100 imputed datasets to be created. [30–32] For consistency, the same
19 imputed datasets will be used across all models. Categorical variables will be imputed using
20 multinomial logistic regression and ordinal variables using ordinal regression. The only
21 continuous variables are GHQ-12 score and IES-R but these will be derived anew following
22 imputation of the individual questions and will not be imputed directly. Imputation will not
23 be necessary for region, grade, and specialty as these are complete by design due to the
24 exclusion criteria. An “impute-then-delete” strategy will be employed for the dependent
25 variable. Effect estimates across imputed datasets will be pooled using Rubin’s rules. [33]

26 27 **Software**

28 All analyses and statistical outputs will be produced in the statistical programming language
29 R. The lme4 package will be used for the mixed-effects models.

30

1 Procedures for reporting any deviation(s) from the original statistical plan

2 Any requirement to deviate from the original statistical plan will be discussed with the Study
3 Management Group and independently reviewed by an external statistician, where
4 appropriate, and documented appropriately with a full explanation as to reasoning and
5 requirement.

7 Data Storage

8 Data will be stored electronically for 5 years by the University Hospital of Bristol and Weston
9 NHS Foundation Trust.

11 Ethics and Dissemination

12 Ethical Approval

13 This project has ethical approval from University of Bath, UK and Children's Health Ireland at
14 Crumlin, Ethics Committee (Online Supplementary 2). Regulatory approval was obtained from
15 the Health Regulation Authority (UK), Health and Care Research Wales (Online
16 Supplementary 3).

18 Risk to participants

19 This survey collects potentially sensitive information, which will be handled in accordance
20 with General Data Protection Regulations. This includes details on participants' baseline
21 health status and psychometric evaluations of anxiety, depression and post-traumatic stress.
22 It will be emphasised in the participant information sheet that such measures are non-
23 diagnostic and that the purpose of the study is to monitor psychological wellbeing on a
24 population level. As scales are being used for non-diagnostic purposes, feedback will not be
25 provided to participants regarding their scores. Participants will be given the option to not
26 disclose existing physical or mental health complaints with these questions listed as
27 'optional'. It is possible that questions relating to personal health and wellbeing may trigger
28 emotive responses in participants. Participants will be signposted to suggested local and

1 national sources in the UK and Ireland where they may obtain support at the beginning and
2 end of each survey.

3

4 Risk to investigators

5 There are no anticipated additional risks to investigators as part of this study. The study may
6 generate media interest. All media releases will be conducted through the Sponsor and/or
7 publishing journals. Media interviews will be undertaken by a senior member of the study
8 group with media training.

9

10 Dissemination

11 Interim study reports will be prepared for public dissemination. On study completion a final
12 manuscript will be submitted to a peer reviewed scientific journal and shared with Medical
13 Royal Colleges to inform stakeholders of the pandemic impact upon this critical workforce.
14 The results will be disseminated widely at scientific conferences.

15 Discussion

16 This large-scale prospective longitudinal survey of frontline doctors builds on previous work
17 regarding psychological wellbeing in acute care settings and looks to assess the
18 psychological impact of the COVID-19 pandemic upon frontline doctors, specifically seeking
19 to understand key personal and professional factors which predict psychological distress in
20 this cohort. Findings will be discussed in relation to the current context and in light of the
21 reported impact of previous infectious disease outbreaks, aiming to contribute to novel data
22 on frontline doctors' mental health in a rapidly emerging field.

23

24 Concerns have been raised regarding the potential and likely negative psychological impact
25 of increasing workload in the already stretched ED clinical environment, with anticipation
26 that this will be exacerbated by the specific and significant challenges of work during the
27 COVID-19 pandemic. [34,35] In line with previous research, frontline healthcare workers
28 are likely to be affected by fears of contamination, disruption of normal supportive

1 structures and work stress. [36] However, there is a paucity of data to quantify these
2 effects. This collaborative research project, which harnesses the extensive reach of
3 research networks, and supported by national professional bodies (such as the Medical
4 Royal Colleges), seeks to address an important research question through rapid mobilisation
5 of existing research infrastructures. The immediate outputs of this work will aim to inform
6 the psychological response to this infection wave and future infection waves by robustly
7 assessing the degree of psychological distress and trauma in the frontline workforce,
8 furthermore gaining a greater understanding of the potentially modifiable personal and
9 professional factors that predict distress. Establishing need is imperative given that trauma
10 and psychological distress has been repeatedly demonstrated negative impact on
11 occupational performance, job satisfaction, physical and psychological. [37–39] By robustly
12 identifying predictive factors associated with mental health outcomes in this population,
13 targets for intervention will be provided; treatment for trauma and psychological distress is
14 evidence-based, efficacious and widely available on the NHS. [40] Recent advancements in
15 psychological therapy provision have expanded adaptations for the frontline staff
16 workforce, [41] however there is currently a lack knowledge concerning the precise
17 prevalence and degree of distress and what characterises those who are most affected. This
18 knowledge is essential to enable tailoring of support, treatment and pathways appropriate
19 to need. This research aims to address that gap and provide a foundation from which to
20 shape service development in order to improve outcomes in this critical workforce.

21
22 The primary limitation to this work lies in estimating the peak phase, and therefore the
23 timepoint of maximal stress upon frontline doctors. This is reliant on national reporting and
24 may not reflect local or regional variations in systems pressure. However, given the high
25 response rate and sample size in the acceleration phase survey, it is planned to mitigate
26 regional effects through pre-defined subgroup analysis. Due to the rapidly developing
27 nature of the pandemic, constraints have prevented the gathering of qualitative data as part
28 of this study. Further research should explore the nature of distress in this population,
29 drawing out themes that would enhance depth of knowledge in this area.

30
31 A further limitation to this work is the lack of baseline level of distress or trauma in this
32 cohort prior to the COVID-19 pandemic. Work within the ED, ICU and anaesthetics is already

1
2
3 1 known to be challenging and impact of Doctors psychological health. [8,42,43] Results of
4
5 2 this study will be presented in the context of the existing literature predating the COVID-19
6
7 3 pandemic.
8
9 4

10 5 In conclusion, this longitudinal professional survey aims to robustly assess the psychological
11
12 6 impact of the COVID-19 pandemic on frontline doctors, using sequential assessment to
13
14 7 assess prevalence and degree of psychological distress across three key timepoints, defining
15
16 8 the nature of the relationship between key personal and professional factors and primary
17
18 9 outcomes of psychological distress and trauma response. This information will provide vital
19
20 10 understanding of the impact of the COVID-19 pandemic on healthcare and wellbeing
21
22 11 amongst clinical responders which will help tailor interventions and provide data for future
23
24 12 planning of psychological support.
25
26 13
27 14
28
29 15
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

References

- 1 Chen N, Zhou M, Dong X, *et al*. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet* 2020;**395**:507–13. doi:10.1016/S0140-6736(20)30211-7
- 2 Guan W, Ni Z, Hu Y, *et al*. Clinical Characteristics of Coronavirus Disease 2019 in China. *N Engl J Med* 2020;:NEJMoa2002032. doi:10.1056/NEJMoa2002032
- 3 Mahase E. China coronavirus: WHO declares international emergency as death toll exceeds 200. *BMJ* 2020;**368**:m408. doi:10.1136/bmj.m408
- 4 WHO Director-General’s opening remarks at the media briefing on COVID-19 - 11 March 2020. <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020> (accessed 31 Mar 2020).
- 5 Chang D, Xu H, Rebaza A, *et al*. Protecting health-care workers from subclinical coronavirus infection. *Lancet Respir. Med.* 2020;**8**:e13. doi:10.1016/S2213-2600(20)30066-7
- 6 Lai J, Ma S, Wang Y, *et al*. Factors Associated With Mental Health Outcomes Among Health Care Workers Exposed to Coronavirus Disease 2019. *JAMA Netw open* 2020;**3**:e203976. doi:10.1001/jamanetworkopen.2020.3976
- 7 What’s behind the A&E “crisis”? | The Nuffield Trust. <https://www.nuffieldtrust.org.uk/resource/what-s-behind-the-a-e-crisis> (accessed 31 Mar 2020).
- 8 Looseley A, Wainwright E, Cook TM, *et al*. Stress, burnout, depression and work satisfaction among UK anaesthetic trainees; a quantitative analysis of the Satisfaction and Wellbeing in Anaesthetic Training study. *Anaesthesia* 2019;**74**:1231–9. doi:10.1111/anae.14681
- 9 Bittner M-I, Donnelly M, van Zanten AR, *et al*. How is intensive care reimbursed? A review of eight European countries. *Ann Intensive Care* 2013;**3**:37. doi:10.1186/2110-5820-3-37
- 10 Ferguson N, Laydon D, Nedjati- Gilani G *et al*. Impact of non-pharmaceutical interventions (NPIs) to reduce COVID19 mortality and healthcare demande. Published Online First: 2020.<https://www.imperial.ac.uk/media/imperial->

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

- 1 college/medicine/sph/ide/gida-fellowships/Imperial-College-COVID19-NPI-modelling-
2 16-03-2020.pdf
- 3 11 Naushad VA, Bierens JJLM, Nishan KP, *et al.* A Systematic Review of the Impact of
4 Disaster on the Mental Health of Medical Responders. *Prehosp. Disaster Med.*
5 2019;**34**:632–43. doi:10.1017/S1049023X19004874
- 6 12 Lin CY, Peng YC, Wu YH, *et al.* The psychological effect of severe acute respiratory
7 syndrome on emergency department staff. *Emerg Med J* 2007;**24**:12–7.
8 doi:10.1136/emj.2006.035089
- 9 13 Brooks SK, Dunn R, Sage CAM, *et al.* Risk and resilience factors affecting the
10 psychological wellbeing of individuals deployed in humanitarian relief roles after a
11 disaster. *J. Ment. Heal.* 2015. doi:10.3109/09638237.2015.1057334
- 12 14 Brooks SK, Dunn R, Amlôt R, *et al.* A Systematic, Thematic Review of Social and
13 Occupational Factors Associated with Psychological Outcomes in Healthcare
14 Employees during an Infectious Disease Outbreak. *J Occup Environ Med* Published
15 Online First: 2018. doi:10.1097/JOM.0000000000001235
- 16 15 Lancee WJ, Maunder RG, Goldbloom DS. Prevalence of psychiatric disorders among
17 Toronto hospital workers one to two years after the SARS outbreak. *Psychiatr Serv*
18 Published Online First: 2008. doi:10.1176/ps.2008.59.1.91
- 19 16 Maunder RG, Lancee WJ, Rourke S, *et al.* Factors associated with the psychological
20 impact of severe acute respiratory syndrome on nurses and other hospital workers in
21 Toronto. *Psychosom. Med.* 2004. doi:10.1097/01.psy.0000145673.84698.18
- 22 17 Ozer EJ, Best SR, Lipsey TL, *et al.* Predictors of posttraumatic stress disorder and
23 symptoms in adults: A meta-analysis. *Psychol. Bull.* 2003;**129**:52–73.
24 doi:10.1037/0033-2909.129.1.52
- 25 18 Brooks SK, Webster RK, Smith LE, *et al.* The psychological impact of quarantine and
26 how to reduce it: rapid review of the evidence. *Lancet.* 2020. doi:10.1016/S0140-
27 6736(20)30460-8
- 28 19 Jones NM, Thompson RR, Schetter CD, *et al.* Distress and rumor exposure on social
29 media during a campus lockdown. *Proc Natl Acad Sci U S A* Published Online First:
30 2017. doi:10.1073/pnas.1708518114
- 31 20 Torales J, O'Higgins M, Castaldelli-Maia JM, *et al.* The outbreak of COVID-19
32 coronavirus and its impact on global mental health. *Int J Soc Psychiatry*

- 1
2
3 1 2020;:002076402091521. doi:10.1177/0020764020915212
4
5 2 21 Holloway R, Rasmussen SA, Zaza S, *et al.* Updated Preparedness and Response
6
7 3 Framework for Influenza Pandemics.
8
9 4 2014. <https://www.cdc.gov/mmwr/preview/mmwrhtml/rr6306a1.htm> (accessed 8
10
11 5 Apr 2020).
12
13 6 22 Goldberg D, Williams P. *A user's guide to the General Health Questionnaire*. London: :
14
15 7 GL Assessment 1988.
16
17 8 23 Goldberg DP, Gater R, Sartorius N, *et al.* The validity of two versions of the GHQ in the
18
19 9 WHO study of mental illness in general health care. *Psychol Med* Published Online
20
21 10 First: 1997. doi:10.1017/S0033291796004242
22
23 11 24 Goldberg DP, Oldehinkel T, Ormel J. Why GHQ threshold varies from one place to
24
25 12 another. *Psychol Med* Published Online First: 1998. doi:10.1017/S0033291798006874
26
27 13 25 Burbeck R, Coomber S, Robinson SM, *et al.* Occupational stress in consultants in
28
29 14 accident and emergency medicine: A national survey of levels of stress at work.
30
31 15 *Emerg Med J* 2002;**19**:234–8. doi:10.1136/emj.19.3.234
32
33 16 26 Horowitz M, Wilner N, Alvarez W. Impact of event scale: A measure of subjective
34
35 17 stress. *Psychosom Med* Published Online First: 1979. doi:10.1097/00006842-
36
37 18 197905000-00004
38
39 19 27 Coronavirus (COVID-19) in the UK.
40
41 20 <https://coronavirus.data.gov.uk/#category=regions&map=rate> (accessed 17 Jun
42
43 21 2020).
44
45 22 28 Eysenbach G. Improving the Quality of Web Surveys: The Checklist for Reporting
46
47 23 Results of Internet E-Surveys (CHERRIES). *J Med Internet Res* 2004;**6**:e34.
48
49 24 doi:10.2196/jmir.6.3.e34
50
51 25 29 Smith J, Keating L, Flowerdew L, *et al.* An Emergency Medicine Research Priority
52
53 26 Setting Partnership to establish the top 10 research priorities in emergency medicine.
54
55 27 *Emerg Med J* Published Online First: 2017. doi:10.1136/emered-2017-206702
56
57 28 30 Marshall A, Altman DG, Holder RL, *et al.* Combining estimates of interest in prognostic
58
59 29 modelling studies after multiple imputation: Current practice and guidelines. *BMC*
60
31 31 M.H. H, J.B. C, J.A. S, *et al.* A comparison of multiple imputation methods for missing
32 data in longitudinal studies. *BMC Med Res Methodol* Published Online First: 2018.

- 1
2
3 1 doi:10.1186/s12874-018-0615-6 LK - http://emory-primoprod.hosted.exlibrisgroup.com/openurl/01EMORY/01EMORY_services_page?sid=EMBASE&issn=14712288&id=doi:10.1186%2Fs12874-018-0615-6&atitle=A+comparison+of+multiple+imputation+methods+for+missing+data+in+longitudinal+studies&stitle=BMC+Med+Res+Methodol&title=BMC+medical+research+methodology&volume=18&issue=1&spage=168&epage=&aulast=Huque&aufirst=Md+H amidul&aunit=M.H.&aufull=Huque+M.H.&coden=&isbn=&pages=168-&date=2018&aunit1=M&aunitm=H
- 4 2
5 3
6 4
7 5
8 6
9 7
10 8
11 9 32 Grund S, Lüdtke O, Robitzsch A. Multiple Imputation of Missing Data for Multilevel Models. *Organ Res Methods* 2018;**21**:111–49. doi:10.1177/1094428117703686
- 12 10
13 11 33 von Hippel PT. 4. Regression with Missing Ys: An Improved Strategy for Analyzing Multiply Imputed Data. *Sociol Methodol* 2007;**37**:83–117. doi:10.1111/j.1467-9531.2007.00180.x
- 14 12
15 13
16 14 34 Godlee F. Covid-19: weathering the storm. *BMJ* 2020;**368**:m1199. doi:10.1136/bmj.m1199
- 17 15
18 16 35 BMA survey finds doctors' lives still at risk despite PPE pledges. <https://www.bma.org.uk/news-and-opinion/bma-survey-finds-doctors-lives-still-at-risk-despite-government-pledges-on-ppe> (accessed 23 Apr 2020).
- 19 17
20 18
21 19 36 Holmes EA, O'Connor RC, Perry VH, *et al.* Multidisciplinary research priorities for the COVID-19 pandemic: a call for action for mental health science. *The Lancet Psychiatry* 2020;**0**. doi:10.1016/S2215-0366(20)30168-1
- 22 20
23 21
24 22 37 Maunder RG, Lancee WJ, Balderson KE, *et al.* Long-term psychological and occupational effects of providing hospital healthcare during SARS outbreak. *Emerg Infect Dis* Published Online First: 2006. doi:10.3201/eid1212.060584
- 25 23
26 24
27 25 38 Arora M, Asha S, Chinnappa J, *et al.* Review article: Burnout in emergency medicine physicians. *EMA - Emerg. Med. Australas.* 2013;**25**:491–5. doi:10.1111/1742-6723.12135
- 28 26
29 27
30 28 39 Fiksenbaum L, Marjanovic Z, Greenglass ER, *et al.* Emotional exhaustion and state anger in nurses who worked during the sars outbreak: The role of perceived threat and organizational support. *Can J Community Ment Heal* Published Online First: 2006. doi:10.7870/cjcmh-2006-0015
- 31 29
32 30
33 31
34 32 40 Pilling S, Whittington C, Taylor C, *et al.* Identification and care pathways for common

- 1
2
3 1 mental health disorders: Summary of NICE guidance. *BMJ*. 2011;**342**.
4 doi:10.1136/bmj.d2868
5 2
6
7 3 41 The psychological needs of healthcare staff as a result of the Coronavirus pandemic. |
8 BPS. [https://www.bps.org.uk/news-and-policy/psychological-needs-healthcare-staff-](https://www.bps.org.uk/news-and-policy/psychological-needs-healthcare-staff-result-coronavirus-pandemic)
9 4 result-coronavirus-pandemic (accessed 23 Apr 2020).
10 5
11
12 6 42 Schneider A, Weigl M. Associations between psychosocial work factors and provider
13 mental well-being in emergency departments: A systematic review. *PLoS One*.
14 7 2018;**13**. doi:10.1371/journal.pone.0197375
15 8
16 9 43 Rotenstein LS, Torre M, Ramos MA, *et al*. Prevalence of burnout among physicians a
17 10 systematic review. *JAMA - J. Am. Med. Assoc.* 2018;**320**:1131–50.
18 11 doi:10.1001/jama.2018.12777
19 12
20 12
21
22
23
24
25

26 13 Acknowledgements

27
28 14 The views expressed are those of the authors and not necessarily those of the NHS, the
29 15 NIHR, the Department of Health or the Royal Colleges involved in survey distribution.
30 16 The authors would like to acknowledge Mai Baquedano, at the University of Bristol, for her
31 17 support with REDCap. The authors would finally like to acknowledge GL Assessments for
32 18 providing the licence for the GHQ-12 free of charge.
33 19
34
35
36
37
38
39

40 20 Author Contributions

41
42 21 Tom Roberts (TR) conceived the idea for the study. TR, Edd Carlton (EC), Jo Daniels (JD),
43 22 Mark Lyttle (ML), and Blair Graham (BG) were responsible for the initial study design, which
44 23 was refined with the help of Katie Samuel (KS), Charles Reynard (CR), Robert Hirst (RH),
45 24 Michael Barrett (MB) and William Hulme (WH). Expert advice on psychological assessment
46 25 scores was provided by JD. WH provided the statistical plan. TR lead the dissemination of
47 26 the study in UK Adult Emergency Departments (ED), ML lead the dissemination of the study
48 27 in UK and Ireland Paediatric EDs, KS lead the dissemination of the study in UK Anaesthetic
49 28 and ICU Departments, MB lead the dissemination of the study in Ireland EDs, ICUs and
50 29 Anaesthetic Departments. TR coordinated study set-up, finalisation of the study surveys and
51 30 finalisations of study protocols. All authors contributed to the final study design and
52
53
54
55
56
57
58
59
60

1
2
3 1 protocol development, critically revised successive drafts of the manuscript and approved
4
5 2 the final version. The study management group is responsible for the conduct of the study.
6
7 3
8

9 4 **Funding**

10
11 5 The Survey platform is provided courtesy of University of Bristol. The chief investigator is
12
13 6 directly funded as a research fellow by the Royal College of Emergency Medicine. The GHQ-
14
15 7 12 is being used under licence from GL assessments; the fee for use of this instrument within
16
17 8 all three surveys has been waived. Dr Carlton is a National Institute for Health Research
18
19 9 Advanced Fellow.
20

21 10 22 23 11 **Competing Interests**

24
25
26 12 Many of the authors have been working as frontline clinicians during the COVID-19 pandemic.
27
28 13 They have no competing interests to declare.
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

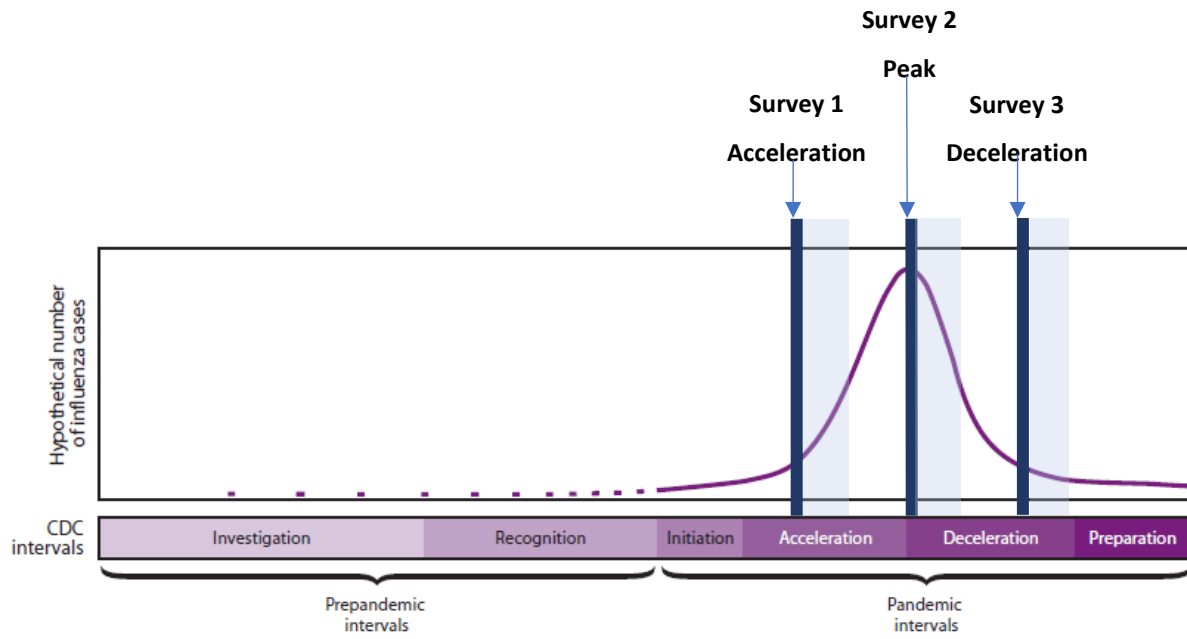


Figure 1. Timing of Surveys in accordance with pandemic preparedness model. Solid blue line represents date of survey issue, transparent blue area represents data collection period (As adapted from the CDC (21))

Online supplementary 1. CERA Survey 1 Questions

Field Label	Choices, Calculations, OR Slider Labels
Do you want to read the participant information sheet now?	
If you would like to download the patient information sheet to read later, please download the link below.	
By checking this box, I certify that I am at least 18 years old and that I give my consent freely to participate in this study.	1, I consent
What is your e-mail address? (This will only be used for the delivery of survey 2 + 3, which you will receive over the coming months)	
What is the name of the Hospital where you work?	
You have selected other, please specify.	
What is your professional grade?	17, GP Trainee 1, ST1 2, ST2 3, ST3 4, ST4 5, ST5 6, ST6 7, ST7 8, ST8 9, F1 10, F2 11, Clinical Fellow (F2-ST3 Level) 12, Clinical Fellow (>=ST4 Level) 13, Consultant 14, Associate Specialist 15, Staff Grade 16, CESR Doctor 18, GP 19, Other
You have selected other, please specify.	
What is your gender?	1, Male 2, Female 3, Other 4, Prefer not to say
How old are you?	1, 20-25 2, 26-30 3, 31-35 4, 36-40 5, 41-45 6, 46-50 7, 51-55 8, 56-60 9, 61-65 10, 66-70 11, >70
What is your 'parent speciality'?	1, Emergency Medicine 2, Anaesthetics 3, Intensive Care Medicine 9, Paediatrics 4, General Practice 5, Surgery 6, Foundation Programme 7, Acute Internal Medicine 8, Other
What is your 'parent speciality'?	1, Emergency Medicine 2, Anaesthetics 3, Intensive Care Medicine 9, Paediatrics 4, General Practice 5, Surgery 6, Foundation Programme 7, Acute Internal Medicine 8, Other
You have selected other, please specify.	
<div class="rich-text-field-label"><p>In what Department were you working as of March 1st 2020?</p></div>	1, Emergency Department (adult or paediatric) 2, Anaesthetic Department (adult or paediatric) 3, Intensive Care Department (adult or paediatric) 5, Acute Medical Unit 6, Hospital ward (adult or paediatric) 4, Other
<div class="rich-text-field-label"><p>In what Department were you working as of March 1st 2020?</p> <p>Select all that apply</p></div>	1, Emergency Department (adult or paediatric) 2, Anaesthetic Department (adult or paediatric) 3, Intensive Care Department (adult or paediatric) 5, Acute Medical Unit 6, Hospital ward (adult or paediatric) 4, Other
<div class="rich-text-field-label"><p>You selected other, in which Department where you working as of March 1st 2020?</p></div>	
Have you been deployed to a different clinical area as a result of the COVID-19 outbreak?	
Where have you been redeployed to?	1, Emergency Department (adult or paediatric) 2, Anaesthetic Department (adult or paediatric) 3, Intensive Care Department (adult or paediatric) 5, Acute Medical Unit 6, Hospital ward (adult or paediatric) 4, Other
You have selected other, please specify.	

How satisfied are you with this redeployment?	1, Very dissatisfied 2, Somewhat dissatisfied 5, Neither satisfied nor dissatisfied 3, Somewhat satisfied 4, Very satisfied
Have you previously provided direct clinical care to any patients affected by these infectious disease outbreaks? (please select all that apply)	0, None of the below 4, Ebola virus 10, MERS-CoV 16, SARS 1, Chikungunya 2, Cholera 6, Influenza (swine, avian, zoonotic) 20, Zika virus 21, Other
You have selected other, please specify.	
Been able to concentrate on whatever you're doing?	1, Better than usual 2, Same as usual 3, Less than usual 4, Much less than usual
Lost much sleep over worry?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
Felt that you are playing a useful part in things?	1, More so than usual 2, Same as usual 3, Less useful than usual 4, Much less useful
Felt capable of making decisions about things?	1, More so than usual 2, Same as usual 3, Less so than usual 4, Much less capable
Felt constantly under strain?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
Felt you couldn't overcome your difficulties?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
Been able to enjoy your normal day-to-day activities?	1, More so than usual 2, Same as usual 3, Less so than usual 4, Much less than usual
Been able to face up to your problems?	1, More so than usual 2, Same as usual 3, Less able than usual 4, Much less able
Been feeling unhappy and depressed?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
Been losing confidence in yourself?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
Been thinking of yourself as a worthless person?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
Been feeling reasonably happy, all things considered?	1, More so than usual 2, About the same as usual 3, Less so than usual 4, Much less than usual
<p><div class="rich-text-field-label"><p>For the above 12 questions the following applies: All rights reserved. This work may not be reproduced by any means, even within the terms of a Photocopying Licence, without the written permission of the publisher. Photocopying without permission may result in legal action. Published by GL Assessment Limited 1st Floor Vantage London, Great West Road, Brentford TW8 9AG This edition published 1992. GL Assessment is part of GL Education. www.gl-assessment.co.uk. David Goldberg, 1978 <strong style="font-family: Calibri, sans-serif; font-size: 14.666666984558105px;">General Health Questionnaire© (GHQ12).</p></div></p>	
Donning and doffing (gloves, gown, facemask, eye protection)	1, No training 2, Formal instructional video 3, Written instruction 4, Simulation training 5, Departmental guidance 6, Other
Formal fit testing for mask	1, No training 2, Formal instructional video 3, Written instruction 4, Simulation training 5, Departmental guidance 6, Other
PPE training for exposure to aerosol generating procedure (e.g. intubation)	1, No training 2, Formal instructional video 3, Written instruction 4, Simulation training 5, Departmental guidance 6, Other
Other. Please specify.	

1		
2		
3		
4	If you have had any further PPE training please specify	
5	What practical education have you received in regards to the clinical care of patients presenting with suspected/diagnosed COVID-19?	0, None 1, Simulation training of a possible case 2, Simulation training of a case requiring aerosol procedure 3, Other
6	You selected other. Please specify.	
7		
8	Government Guidance	1, Hourly 2, Up to twice a day 3, Daily 4, Several times a week 5, Weekly 6, Less than weekly 7, Never
9		
10	College Guidance	1, Hourly 2, Up to twice a day 3, Daily 4, Several times a week 5, Weekly 6, Less than weekly 7, Never
11		
12	Trust Guidance	1, Hourly 2, Up to twice a day 3, Daily 4, Several times a week 5, Weekly 6, Less than weekly 7, Never
13		
14	Departmental guidance	1, Hourly 2, Up to twice a day 3, Daily 4, Several times a week 5, Weekly 6, Less than weekly 7, Never
15		
16	Social Media	1, Hourly 2, Up to twice a day 3, Daily 4, Several times a week 5, Weekly 6, Less than weekly 7, Never
17		
18	Online blogs and podcasts	1, Hourly 2, Up to twice a day 3, Daily 4, Several times a week 5, Weekly 6, Less than weekly 7, Never
19		
20	Peer review literature	1, Hourly 2, Up to twice a day 3, Daily 4, Several times a week 5, Weekly 6, Less than weekly 7, Never
21		
22	How confident do you feel in the infection control training that has been provided to you?	1, Not confident at all 2, Somewhat not confident 3, Somewhat confident 4, Very confident
23		
24	How prepared do you feel to provide direct care to suspected cases?	1, Completely unprepared 2, Somewhat unprepared 3, Somewhat prepared 4, Very prepared
25		
26	How do you feel the care received by patients who are NOT presenting with either symptoms or a diagnosis of COVID-19 is?	1, Significantly worse than before Covid-19 2, Slightly worse than before Covid-19 3, The same as before Covid-19 4, Slightly better than before Covid-19 5, Significantly better than before Covid-19
27		
28	How many suspected cases of COVID-19 have you had direct clinical contact with since March 1st 2020?	0, 0 1, 1-5 2, 6-10 3, 11-15 4, 16-20 5, 21-25 6, 26-30 7, 31-35 8, > 36
29		
30	As far as you are aware, how many of these suspected cases have turned out to be confirmed cases of COVID-19?	0, 0 1, 1-5 2, 6-10 3, 11-15 4, 16-20 5, 21-25 6, 26-30 7, 31-35 8, > 36
31		
32	Are you concerned that the exposure to the COVID-19 outbreak may increase symptoms of any established medical health conditions?	0, Yes 1, No 2, Prefer not to disclose 3, I do not have an established medical condition
33		
34	Are you concerned that the exposure to the COVID-19 outbreak may increase symptoms of any established mental health conditions?	0, Yes 1, No 2, Prefer not to disclose 3, I do not have an established mental health condition
35		
36	I feel that my personal health is at risk during the COVID-19 outbreak due to my clinical role?	1, Strongly disagree 2, Disagree 3, Agree 4, Strongly agree
37		
38	How worried are you about the potential risks if you were to become infected with COVID-19?	1, Extremely worried 2, Generally worried 3, Generally not worried 4, Not worried at all
39		
40	How worried are you about the potential risks to your family, loved ones or others due to your clinical role in the COVID-19 outbreak?	1, Extremely worried 2, Generally worried 3, Generally not worried 4, Not worried at all
41		
42	Have you had to self-isolate?	
43		
44	For what reason did you have to self-isolate?	1, Personal symptoms 2, Symptoms of a member of the household 3, Exposure to a positive case of COVID-19 in the work environment 4, Exposure to a positive case of COVID-19 in your personal environment 5, Personal diagnosis of COVID-19 6, Other (eg return from travel to high risk area)
45		
46	Other - please specify	
47		
48	How many clinical shifts in your rota have you missed due to self-isolation?	0, 0 1, 1 2, 2 3, 3 4, 4 5, 5-7 6, 8-10 7, >10
49		
50		
51		
52		
53		
54		
55		
56		
57		
58		
59		
60		

Date survey completed	
This is part 2 of the CERA survey. Thank you for taking the time to fill out the questions below.	
<p><div class="rich-text-field-label"><p>I have felt well supported by friends and family over the past two weeks (ie. since the national peak of the pandemic)?</p></div></p>	1, Strongly disagree 2, Disagree 5, Neither agree nor disagree 3, Agree 4, Strongly agree
<p><div class="rich-text-field-label"><p>I have felt well supported by colleagues over the past two weeks (ie. since the national peak of the pandemic) </p></div></p>	1, Strongly disagree 2, Disagree 5, Neither agree nor disagree 3, Agree 4, Strongly agree
<p><div class="rich-text-field-label"><p>During the COVID-19 pandemic, I have felt at personal high risk of dying/death?</p></div></p>	1, Yes 2, No
<p><div class="rich-text-field-label"><p>During the COVID-19 pandemic, I have witnessed the death of COVID-19 patients.</p></div></p>	1, Yes 2, No
<p><div class="rich-text-field-label"><p>Over the course of your life, have you experienced what you would characterise as a trauma?</p></div></p>	1, Yes 2, No
<p><div class="rich-text-field-label"><p>In the last two weeks I have experiences strong feelings of guilt, shame or helplessness as a consequence to my experience of working with COVID-19?</p></div></p>	1, Strongly disagree 2, Disagree 5, Neither agree nor disagree 3, Agree 4, Strongly agree
<p><div class="rich-text-field-label"><p>Have you had any loved ones receive intensive care treatment or die due to COVID-19 infection?</p></div></p>	1, Yes 2, No
<p><div class="rich-text-field-label"><p>Have you had any colleagues receive intensive care treatment or die due to COVID-19 infection?</p></div></p>	1, Yes 2, No
<p><div class="rich-text-field-label"><p>We should like to know if you have had any medical complaints, and how your health has been in general, over the past few weeks.

Please answer ALL the questions simply by selecting the answer which you think most nearly applies to you. Remember that we want to know about present and recent complaints, not those you had in the past. It is important that you try to answer ALL the questions.</p></div></p>	
Been able to concentrate on whatever you're doing?	1, Better than usual 2, Same as usual 3, Less than usual 4, Much less than usual
Lost much sleep over worry?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
Felt that you are playing a useful part in things?	1, More so than usual 2, Same as usual 3, Less useful than usual 4, Much less useful
Felt capable of making decisions about things?	1, More so than usual 2, Same as usual 3, Less so than usual 4, Much less capable
Felt constantly under strain?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual

Felt you couldn't overcome your difficulties?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
Been able to enjoy your normal day-to-day activities?	1, More so than usual 2, Same as usual 3, Less so than usual 4, Much less than usual
Been able to face up to your problems?	1, More so than usual 2, Same as usual 3, Less able than usual 4, Much less able
Been feeling unhappy and depressed?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
Been losing confidence in yourself?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
Been thinking of yourself as a worthless person?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
Been feeling reasonably happy, all things considered?	1, More so than usual 2, About the same as usual 3, Less so than usual 4, Much less than usual
Below is a list of difficulties people sometimes have after stressful life events. Please read each item, and then indicate how distressing each difficulty has been for you DURING THE PAST SEVEN DAYS with respect to the PEAK of the COVID-19 pandemic that occurred on _____. How much have you been distressed or bothered by these difficulties?	
Any reminder brought back feelings about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I had trouble staying asleep	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
Other things kept me thinking about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I felt irritable and angry	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I avoided letting myself get upset when I thought about it or was reminded of it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I thought about it when I didn't mean to	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I felt as if it hadn't happened or wasn't real	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I stayed away from reminders of it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
Pictures about it popped into my head	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I was jumpy and easily startled	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I tried not to think about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I was aware that I still had a lot of feelings about it, but I didn't deal with them	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
My feelings about it were kind of numb	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I found myself acting or feeling like I was back at that time	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I had trouble falling asleep	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I had waves of strong feelings about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I tried to remove it from my memory	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely

I had trouble concentrating	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea or a pounding heart	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I had dreams about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I felt watchful and on-guard	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I tried not to talk about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
Any reminder brought back feelings about it?	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I had trouble staying asleep	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
Other things kept me thinking about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I felt irritable and angry	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I avoided letting myself get upset when I thought about it or was reminded of it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I thought about it when I didn't mean to	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I felt as if it hadn't happened or wasn't real	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I stayed away from reminders of it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
Pictures about it popped into my mind	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I was jumpy and easily startled	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I tried not to think about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I was aware that I still had a lot of feelings about it, but I didn't deal with them	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
My feelings about it were kind of numb	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I found myself acting or feeling like I was back at that time	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I had trouble falling asleep	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I had waves of strong feelings about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I tried to remove it from my memory	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I had trouble concentrating	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea or a pounding heart	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I had dreams about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I felt watchful and on-guard	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely

I tried not to talk about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
On average, how many pills did you take each day last week?	0, Less than 5 1, 5-10 2, 6-15 3, Over 15
Using the handout, which level of dependence do you feel you are currently at?	0, 0 1, 1 2, 2 3, 3 4, 4 5, 5
The choices you made	1, Not satisfied at all 2, Somewhat dissatisfied 3, Indifferent 4, Somewhat satisfied 5, Very satisfied
Your life overall	1, Not satisfied at all 2, Somewhat dissatisfied 3, Indifferent 4, Somewhat satisfied 5, Very satisfied
Your job	1, Not satisfied at all 2, Somewhat dissatisfied 3, Indifferent 4, Somewhat satisfied 5, Very satisfied
Your family life	1, Not satisfied at all 2, Somewhat dissatisfied 3, Indifferent 4, Somewhat satisfied 5, Very satisfied

Online Supplementary 2. Ethical Approval

Received 16th March 2020

This Ethics Form has now been signed off by the HoD.

Please click [here](#) to open **Form No: 4421**

No further action is required. To see all the forms signed off, please click on the link above.

Please click [here](#) to view **All your Approved Ethics Forms.**

If you require any assistance or need to report a technical fault or issue with the form please refer to the following contact details:

Ethics Form: Technical Issues, Procedures & Suggestions:- ethics@lists.bath.ac.uk

Ethics Form: Urgent Technical Issues: c.j.cooper@bath.ac.uk



Children's Health Ireland
at Crumlin

Stáinte Leanaí Éireann (SLÉ) ag Cromghlinn, D12 N512, Éire
Children's Health Ireland (CHI) at Crumlin, D12 N512, Ireland
T + 353 (0) 1 409 6100 | F + 353 (0) 1 455 8873 | www.olchc.ie
Cosc ar úsáid d'oidis leighis | Not for prescription purposes

ETHICS (MEDICAL RESEARCH) COMMITTEE OFFICE

Tel: +353 (01) 409 6307/6243

A/Professor Michael Barrett
Consultant in Paediatric Emergency Medicine
Children's Health Ireland (CHI) at Crumlin
Dublin D12 N512

24th March 2020

REC Reference: GEN/806/20

The COVID-19 Emergency Response Assessment Survey
Principal Investigator: A/Professor Michael Barrett

Dear Professor Barrett

The Ethics (Medical Research) Committee at this hospital reviewed and approved the above Study.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Claire Rice'.

Claire Rice
Secretary
Ethics (Medical Research) Committee

Online Supplementary 3. HRA and Health and Care Research Wales, Approval



Dr Tom Roberts
TERN Fellow
Royal College of Emergency Medicine
7-9 Bream Buildings
London
EC4A 1DT

Email: approvals@hra.nhs.uk
HCRW.approvals@wales.nhs.uk

18 March 2020

Dear Dr Roberts

**HRA and Health and Care
Research Wales (HCRW)
Approval Letter**

Study title: COVID-19 Emergency Response Assessment (CERA)
IRAS project ID: 281944
Protocol number: Protocol 1.
REC reference: 20/HRA/1500
Sponsor North Bristol NHS Trust

I am pleased to confirm that [HRA and Health and Care Research Wales \(HCRW\) Approval](#) has been given for the above referenced study, on the basis described in the application form, protocol, supporting documentation and any clarifications received. You should not expect to receive anything further relating to this application.

Please now work with participating NHS organisations to confirm capacity and capability, [in line with the instructions provided in the "Information to support study set up" section towards the end of this letter.](#)

How should I work with participating NHS/HSC organisations in Northern Ireland and Scotland?

HRA and HCRW Approval does not apply to NHS/HSC organisations within Northern Ireland and Scotland.

If you indicated in your IRAS form that you do have participating organisations in either of these devolved administrations, the final document set and the study wide governance report (including this letter) have been sent to the coordinating centre of each participating nation. The relevant national coordinating function/s will contact you as appropriate.

BMJ Open

The COVID-19 Emergency Response Assessment Study; a prospective longitudinal survey of frontline doctors in the UK and Ireland: Study Protocol

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2020-039851.R2
Article Type:	Protocol
Date Submitted by the Author:	22-Jul-2020
Complete List of Authors:	Roberts, Tom; The Royal College of Emergency Medicine, Daniels, Jo; University of Bath Hulme, William Horner , Daniel; The Royal College of Emergency Medicine; Salford Royal Hospitals NHS Trust, Department of Intensive Care Lyttle, Mark; Bristol Royal Hospital for Children, Emergency Department; University of the West of England, Faculty of Health and Applied Science Samuel, Katie; North Bristol NHS Trust, Department of Anaesthesia Graham, Blair; University of Plymouth; Plymouth Hospitals NHS Foundation Trust, Emergency Department Hirst, Robert; North Bristol NHS Trust, Department of Anaesthesia Reynard, Charles ; The University of Manchester Barrett, Michael; University College Dublin Carlton, Edward; North Bristol NHS Trust, Emergency Department; The Royal College of Emergency Medicine
Primary Subject Heading:	Mental health
Secondary Subject Heading:	Emergency medicine, Anaesthesia, Intensive care, Infectious diseases
Keywords:	ACCIDENT & EMERGENCY MEDICINE, ANAESTHETICS, INTENSIVE & CRITICAL CARE, PSYCHIATRY

SCHOLARONE™
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Title Page

The COVID-19 Emergency Response Assessment Study; a prospective longitudinal survey of frontline Doctors in the UK and Ireland: Study Protocol

Short Title

The CERA Study

Tom Roberts^{1, 2}, Jo Daniels³, William Hulme⁴, Daniel Horner^{2, 5, 11}, Mark D Lyttle^{6, 7}, Katie Samuel⁸, Blair Graham^{9, 10}, Robert Hirst⁸, Charles Reynard¹¹, Michael J Barrett^{12, 13, 14} and Edward Carlton^{1, 2} on Behalf of TERN, PERUKI, RAFT, ITERN and SATARN

Corresponding Author: Dr Tom Roberts, Tomkieranroberts@gmail.com, 07894234121, 12 Hamilton Road, Bristol, BS3 1PB

Affiliations:

- 1) Emergency Department, North Bristol NHS Trust, Bristol, UK.
- 2) Royal College of Emergency Medicine, London, UK
- 3) Department of Psychology, University of Bath, UK
- 4) Centre for Health Informatics, University of Manchester, UK
- 5) Department of Intensive Care and Emergency Department, Salford Royal Hospital NHS Trust
- 6) Emergency Department, Bristol Royal Hospital for Children, UK
- 7) Faculty of Health and Applied Sciences, University of the West of England, Bristol
- 8) Department of Anaesthesia, North Bristol NHS Trust, UK
- 9) University of Plymouth
- 10) Emergency Department, University Hospitals Plymouth, UK
- 11) University of Manchester
- 12) Department of Emergency Medicine, Children's Health Ireland at Crumlin, Ireland
- 13) School of Medicine, Women's and Children's Health, University College Dublin, Ireland
- 14) Irish Association of Emergency Medicine, Ireland

Word Count: 4762

Abstract

Introduction

The COVID-19 pandemic is putting an unprecedented strain on healthcare systems globally. The psychological impact on frontline doctors of dealing with the COVID-19 pandemic is currently unknown. This longitudinal professional survey aims to understand the evolving and cumulative effects of working during the COVID-19 outbreak on the psychological wellbeing of doctors working in Emergency Departments (ED), Intensive Care Units (ICU) and Anaesthetics during the pandemic.

Methods and Analysis

This study is a longitudinal questionnaire-based study with three pre-defined time points spanning the acceleration, peak, and deceleration phases of the COVID-19 pandemic. The primary outcomes are psychological distress and post-trauma stress as measured by the General Health Questionnaire-12 (GHQ-12) and Impact of Events Scale-Revised (IES-R). Data related to personal and professional characteristics will also be collected. Questionnaires will be administered prospectively to all doctors working in ED, ICU and Anaesthetics in the UK and Ireland via existing research networks during the sampling period. Data from the questionnaires will be analysed to assess the prevalence and degree of psychological distress and trauma, and the nature of the relationship between personal and professional characteristics and the primary outcomes. Data will be described, analysed and disseminated at each time point; however, the primary endpoint will be psychological distress and trauma at the final time point.

Ethics and Dissemination

Ethical approval was obtained from University of Bath, UK (ref:4421), and Children's Health Ireland at Crumlin, Ethics Committee. Regulatory approval from the Health Regulation Authority (UK), Health and Care Research Wales (IRAS: 281944).

This study is limited by the fact it focuses on doctors only and is survey based without further qualitative interviews of participants. It is expected this study will provide clear

1
2
3 evidence of the psychological impact of COVID-19 on doctors and will allow present and
4 future planning to mitigate against any psychological impact.
5
6
7

8
9 Registration Details –

10
11 ISRCTN: 10666798
12
13

14 Article Summary

15 16 Strengths and Limitations of this Study

- 17
18 • This longitudinal study will assess psychological wellbeing in frontline doctors, at
19 three time points across the pandemic wave, providing novel data in this potentially
20 at-risk group
21
22
- 23
24 • Both the GHQ-12 and IES-R have both been previously used in infectious disease
25 outbreaks to measure psychological distress and trauma response
26
27
- 28
29 • Collection of data at the 'peak' phase, capturing the degree of distress and personal
30 and professional factors associated with distress at a prime timepoint of maximal
31 stress upon frontline doctors.
32
33
- 34
35 • Pre-determined data collection points are reliant on national reporting and may not
36 accurately reflect local or regional variations in systems pressure.
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Introduction

Severe Acute Respiratory Syndrome Virus Covariant 2 (SARS-CoV-2) is a presumed zoonotic novel coronavirus that first emerged in the province of Hubei, China during late 2019. [1] Viral transmission is presumed to be via droplet spread and it multiplies in respiratory epithelium. Clinical manifestations of the resulting COVID-19 disease include bilateral interstitial pneumonia, acute respiratory distress syndrome, and multi-organ dysfunction syndrome. [2] Due to high transmissibility, hospitalisation rates, critical care requirements and mortality rate in elderly and vulnerable populations, COVID-19 has created a public health emergency, [3] and was declared a pandemic by the World Health Organisation on the 11th March 2020. [4]

Clinicians in acute and critical healthcare services provide medical care at the point of highest risk of disease transmission, and frequently undertake aerosol generating procedures which increase their exposure to SARS-CoV-2. During comparable infectious disease outbreaks such as SARS-CoV and Ebola, healthcare workers were over-represented in disease incidence and poor clinical outcomes. Such concerns relating to COVID-19 are reflected in experiences anecdotally reported from the international healthcare community. [5]

This study will focus on doctors and not the wider healthcare workforce. It is well documented that other professions are potentially impacted more by infectious disease outbreaks and by COVID-19. [6] Discussions were held between the study team and representatives from the Royal College of Nursing UK and College of Paramedics UK about a combined study. It was agreed that due to the limited timescale to collect data during the acceleration phase and complexities around different working practices that delaying data collection to involve a wider cohort would threaten the viability of the study. This protocol was shared with the Colleges to support their independent studies, as well as ongoing information sharing to support study implementation.

In the UK and Ireland, doctors working in Emergency Departments (ED), Intensive Care Units (ICU) and Anaesthetics will be responsible for the initial identification, management and ongoing treatment of patients presenting with COVID-19. In addition, many difficult decisions

1
2
3 relating to treatment escalation and resource allocation for individual patients will be made
4 by clinicians working in these key areas. Many doctors are likely to be redeployed to these
5 clinical areas or asked to work beyond their level of seniority. In addition, these doctors are
6 likely to be directly responsible for the care of colleagues and staff members with the
7 infection.
8
9
10
11
12

13
14 Resources in these clinical areas are already stretched at baseline. Operational pressures
15 within EDs, critical care settings and emergency anaesthetic provision have been severe and
16 escalating over a period of many years. This is reflected in the time to complete care episodes
17 and health outcomes [7], the impact of fatigue and burnout within anaesthesia and ICU
18 training [8] and the UK and Ireland having some of the lowest numbers of critical care beds
19 per 100,000 of population in Europe. [9] This has resulted in concerns regarding surge
20 capacity of facilities to cope with a pandemic illness. [10] The psychological, emotional and
21 physical demands placed on an already overstretched workforce may therefore be
22 substantial.
23
24
25
26
27
28
29
30
31

32 It is evident from a substantial body of research across disaster settings that there is often a
33 significant and long-lasting negative impact on the psychological wellbeing of clinicians
34 involved. [11,12] Similar themes are also emerging from the COVID-19 pandemic in a cross-
35 sectional survey undertaken in selected healthcare workers in China. [6]
36
37
38
39
40

41 Key factors in predicting psychological distress post trauma span a range of domains and
42 include preparedness and training, [13–15] social and occupational support, [13–16], risk
43 exposure and threat to life, [14,16,17] self-isolation, [14,16,18] media use [19,20] negative
44 affect following exposure, [14,16–18] history of mental health problems and previous
45 trauma. [15,17,18] Yet, these have largely been identified post-hoc, in the aftermath of
46 events and without prospective data collection or a comprehensive understanding of the
47 relative impact of these factors as an event unfolds.
48
49
50
51
52
53
54
55

56 To date, no large-scale longitudinal studies have proposed to prospectively examine the
57 psychological distress and trauma response in clinicians during the acceleration, peak and
58 deceleration phase of the pandemic wave of COVID-19. This study aims to understand the
59
60

1
2
3 evolving and cumulative effects of working in EDs, ICUs and Anaesthesia during the COVID-19
4 outbreak, specifically seeking to understand key personal and professional factors which
5 predict psychological distress in this cohort of frontline doctors.
6
7
8
9

10 Methods and Analysis

11
12
13 The primary aim of this study is to assess the prevalence and degree of psychological distress
14 and trauma in doctors providing frontline care during the acceleration, peak, and deceleration
15 phases of the COVID-19 pandemic, and furthermore establish which personal and
16 professional factors are associated with psychological distress at these time points.
17
18
19

20
21
22 More specifically, the objectives are to:

- 23 1. Evaluate personal and professional factors contributing to psychological wellbeing at
24 the acceleration, peak, and deceleration phase of the pandemic
- 25 2. Establish the incidence of self-reported COVID-19 infection and self-isolation amongst
26 frontline doctors, and to evaluate any association with psychological wellbeing
- 27 3. Assess regional and national variation of psychological distress and trauma in doctors
28 within the UK and Republic of Ireland
29
30
31
32
33
34
35
36
37

38 Study Design and Conduct

39
40 This prospective online longitudinal survey consists of three phases commensurate with the
41 fluctuation of an initial pandemic wave of COVID-19 in the UK and Ireland. More specifically:
42
43
44

- 45 • Phase 1: Acceleration Survey; administered at 0 months (March 2020)
- 46 • Phase 2: Peak Survey; administered on day 7 following the pandemic peak, as defined
47 by COVID-19 related hospital deaths, in the UK and Ireland
- 48 • Phase 3: Deceleration Survey; administered 30 days following the peak survey.
49
50
51
52
53

54 These three phases have been adapted from the Centre for Disease Control (CDC)
55 “Preparedness and Response Framework for Influenzae Pandemics”(Figure 1). [21]
56
57
58
59
60

1
2
3
4
5 *Figure 1. Timing of Surveys in accordance with pandemic preparedness model. Solid blue line represents date of survey*
6 *issue, transparent blue area represents data collection period (As adapted from the CDC [21])*
7
8
9

10 Outcome Measures

11
12
13 The co-primary outcome measures will be GHQ-12 scores from Phase 1, 2 and 3 surveys, and
14 the IES-R score in Phase 2 and 3 surveys.
15
16

17
18
19 The General Health Questionnaire - 12 (GHQ-12) [22] is a brief, validated, 12 item self-
20 report measure devised to screen for psychological distress in the general population. It
21 assesses current state (rather than long-standing attributes) and asks the participants to
22 compare to usual state. The measure has high specificity and sensitivity, with reliability
23 demonstrated across a range of cultures and populations. [23] The GHQ-12 has been used in
24 similar clinician-based studies measuring the psychological impact of infectious outbreaks
25 [14] and was chosen due to the brevity of the measure and its suitability for time pressured
26 medical staff. The GHQ-12 can be scored using several methods and we will report 2 of
27 these in our results. The first, the 0-0-1-1 scoring method, is the most commonly utilised,
28 and has the highest sensitivity and specificity overall. [23] This method has an established
29 clinical cut-off of > 3 which we will use to calculate prevalence of case level psychological
30 distress in our study sample. [23–25] The second uses a 0-1-2-3 scoring method which
31 is sensitive to changes across time points, however unlike the first method, there is no
32 established cut-off and this technique reflects degree of distress rather than threshold
33 caseness. We will use this method to detect within-person changes within our sample. By
34 presenting the two different scoring methods we can both report the prevalence of case
35 level distress across the sample (0-0-1-1 scoring method) and detect changes within the
36 sample over the three phases of the pandemic (0-1-2-3 scoring method).
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54

55 The Impact of Events Scale - Revised (IES-R) [26] is a 22 item measure commonly used to
56 measure post-traumatic stress following a pre-specified traumatic incident. Items are scored
57 on a Likert scale, ranging from 0 representing 'not at all' to 4 representing 'extremely'. The
58
59
60

IES-R has been commonly used in infectious disease outbreaks to assess post-traumatic stress in hospital staff. [14] The IES-R has three subscales, relating to intrusion, avoidance and hyperarousal. Responses will be analysed similarly to the GHQ-12, assigning the responses as 0, 1, 2, 3, 4 (positive to negative) producing a score in the range 0 to 88. A score of 24 or above will indicate a clinically significant stress response.

Secondary outcome measures will be pre-defined personal and professional characteristics (Table 1) and their association with psychological distress as defined by GHQ-12 and IES-R.

Table 1 – Personal and Professional Questions

Demographic Data	Survey.1	Survey.2	Survey.3
Age	✓		
Gender	✓		
Ethnicity		✓	
Employment related factors	Survey.1	Survey.2	Survey.3
Name of Hospital	✓		
Parent Speciality	✓		
Type of Department	✓		
Redeployed to another clinical area	✓	✓	
Where have you been redeployed to	✓	✓	
How satisfied are you with this redeployment	✓	✓	
Deployment back to original place of work			✓
Local availability of psychological support		✓	✓
Training and experience	Survey.1	Survey.2	Survey.3
Previous infectious disease experience	✓		
Exposure to suspected/confirmed cases of COVID-19	✓	✓	✓
Exposure to patients who have died due to suspected or confirmed COVID-19		✓	✓
Personal Protective Equipment Training	✓	✓	
Confidence in Personal Protective Equipment Training	✓	✓	✓
COVID-19 practical clinical care training and confidence	✓	✓	✓
Frequency of access and sources of clinical information	✓	✓	
Perception of preparedness	✓	✓	✓
Personal factors	Survey.1	Survey.2	Survey.3
Concern regarding worsening of mental health condition	✓	✓	✓

Concern regarding worsening of physical health condition	✓	✓	✓
Concerns about risk to personal health	✓	✓	✓
Concerns about risk to family or loved ones	✓	✓	✓
Experience of previous significant trauma (prior to COVID-19 pandemic)		✓	✓
Concern about risk of death to self		✓	✓
Perception of support from friends and family		✓	✓
Perception of support from senior leadership team		✓	✓
Perception of impact on other patient groups (not COVID-19)	✓	✓	✓
Positive factors related to involvement with Coronavirus response		✓	✓
Personal experience of COVID-19	Survey.1	Survey.2	Survey.3
Have you had to self-isolate	✓	✓	✓
Reason for self-isolation	✓	✓	✓
Number of clinical shifts missed due to self-isolation	✓	✓	✓
Have you received a positive Coronavirus diagnosis		✓	✓
Have you been admitted to hospital due to Coronavirus		✓	✓
Have you received an antibody test			✓
What was the result of the antibody test			✓
Any COVID-19 related illness or death in family or friends		✓	✓
Any COVID-19 related illness or death in colleagues		✓	✓

Participants

Frontline medical staff employed in their main role as a doctor in the ED, ICU or Anaesthetics in the UK and Ireland at the point of study commencement will be invited to participate. All grades of medical staff will be eligible to participate.

Doctors who move clinical setting between surveys will not be excluded, provided they remain within an acute trust setting. Doctors whose main place of employment at the point of study commencement is not the ED, ICU or Anaesthetics and Non-doctors working in ED, ICU or Anaesthetics will be excluded. Participants will be asked to declare the hospital they work in. Hospitals will be grouped into regions as defined by UK Government Coronavirus death reporting. [27]

Survey Distribution

All potential participants will be invited to participate in the Phase 1 survey through established acute care research networks: in Emergency Medicine, members of the Trainee Emergency Research Network (TERN), Irish Trainee Emergency Research Network (I-TERN), Irish Association of Emergency Medicine and Paediatric Emergency Research in the UK and Ireland (PERUKI) will be invited to register as participating sites via institutional email and instant messaging groups. A site lead will be identified in each centre who will be responsible for distributing the participation link for Phase 1 Survey and encouraging participation through the display of relevant materials. In order to mitigate against non-UK or Ireland doctors and other healthcare groups completing the survey, the participation link will not be shared on wider social media platforms.

In the fields of Intensive Care and anaesthesia, participants will be invited to complete the Phase 1 Survey via the UK Research and Audit Federation of Trainees (RAFT) network membership groups and the Irish Specialist Anaesthesiology Trainee Audit & Research Network (SATARN) via email and instant messaging. Additionally, participation invitations will be disseminated by the Royal College of Anaesthetists, College of Anaesthesiologists of Ireland and National Institute of Health Research (NIHR) Clinical Research Networks (including Trauma and Emergency Care, Critical Care and Anaesthesia & perioperative medicine) via email to regional leads, with additional invitations to all UK anaesthetists via the Lifelong Learning Platform. The Trainee Research in Intensive Care network (TRIC) will also distribute the survey link amongst their members and through the Faculty of Intensive Care Medicine (FICM).

Survey Design

The survey has been designed and managed in line with the Checklist for Reporting Results of Internet E-surveys (CHERRIES) guidelines. [28] A summary of survey construction is outlined in Table 2. Each survey was developed iteratively by the study team and underpinned by evidence where available, or by consensus where necessary. Literature reviews were performed to identify factors with potential impact on psychological distress and trauma. Psychometric tools were selected by consensus of the study team, considering validity and utility of a range of measures, balanced against the feasibility of delivery and completion by individuals likely to be working at maximum capacity. Each survey will be piloted by members of the study team prior to full release.

Study Phase	Survey	Characteristics						Psychometric Evaluation	
		Informed Consent	Basic Demographic Data	Employment Related Data	Training and Experience Data	Personal factors	Personal Experience of COVID-19	Psychological Wellbeing	Trauma Response
								GHQ12 ¹	IESR ²
Acceleration	1	✓	✓	✓	✓	✓	✓		
Peak	2	✓	-	✓	✓	✓	✓	✓	
Deceleration	3	✓	-	✓	✓	✓	✓	✓	
		¹ General Health Questionnaire ² Impact of Events Scale- Revised							

Table 2: Study design summary table

Phase 1: Acceleration Survey

Phase 1 survey (Online Supplementary 1) will gather consent and contact e-mail address, selected personal and professional characteristics and responses to the GHQ-12 survey.

Phase 2: Peak Survey

All participants who completed the Phase 1 survey will be invited via the REDCap invite function to complete Phase 2 and 3 surveys. This uses a secure institutional email to deliver email invitations. The Phase 2 Survey will gather consent and additional demographic, experiential or work-related data. No additional personal identifiable information will be taken. Participants will be requested to complete a serial evaluation of GHQ-12 and the IES-R; these are both valid and reliable short-form measures of their original counterparts and are used in order to limit participant fatigue.

Phase 3: Deceleration Survey

Phase 3 Survey will gather consent and further data on personal and professional factors. No additional personal identifiable information will be taken, and it will be ensured that the survey does not exceed a reasonable length, to limit participant fatigue. Participants will be requested to complete a serial evaluation of GHQ-12 and IES-R.

Survey Timeline

Identification of pandemic phases to guide survey release

The surveys will be released in-keeping with the CDC pandemic framework outlined in Figure 1. As the current outbreak is dynamic by its very nature, the exact timings of the peak and deceleration phases are uncertain but will be identified using the below criteria.

Identification of Acceleration Phase

The authors reached a consensus decision on 17th March 2020, based on best available evidence from Public Health England (PHE) that the UK was in the 'acceleration phase' of the

1
2
3 current COVID-19 outbreak. Phase 1 survey was opened on March 18th 2020, for a period of
4 ten days.
5
6
7
8

9 *Identification of Peak Phase*

10
11 The authors will hold regular remote meetings to monitor the evolving COVID-19 outbreak.
12 The 'Peak' survey will be released 7-days after the *first* UK and *first* Republic of Ireland
13 national peaks of COVID-19 related deaths. The 7-day time delay is due to the requirement of
14 the IES-R scale to reflect on feelings over the last 7-days, thus a delay will ensure answers
15 more accurately represent true outcomes from the pandemic peak. Nationally reported death
16 rates have been chosen rather than confirmed cases due to a lack of consistency in screening
17 and reporting of confirmed cases in the UK and Ireland. As UK national death rates are publicly
18 available, in comparison to regional death rates, it is recognised that regional variation may
19 occur.
20
21
22
23
24
25
26
27
28
29

30 The UK and Republic of Ireland national peaks will be decided by a consensus decision of the
31 Study Management Group, which will be recorded and documented in the final study
32 report. The consensus decision will be guided by:
33

- 34 • Publicly available COVID-19 daily death rates data from PHE (accessed via:
35 <https://coronavirus.data.gov.uk>) and Ireland's Department of Health (accessed via:
36 <https://www.gov.ie/en/news/7e0924-latest-updates-on-covid-19-coronavirus/>)
37
38
- 39 • Government daily briefings
40
- 41 • Published modelling literature
42
43
44
45

46 The survey will remain open for 14 days to ensure maximal response rates.
47
48
49

50 *Identification of Deceleration Phase*

51
52 The deceleration phase is defined by the CDC as "consistently decreasing rate of cases". [21]
53 To ensure the deceleration survey is released during this phase, it will be released 30 days
54 after the administration of the 'Peak' Survey. This is to ensure UK and Republic of Ireland
55
56
57
58
59
60

1
2
3 cases are consistently decreasing and that there is no evidence of a second peak. The survey
4 will remain open for 21 days.
5
6
7
8

9 Informed Consent

10
11 Electronic informed consent will be obtained prior to completion of each round of the
12 surveys.
13
14
15
16
17

18 Withdrawal

19
20
21 Participants can exit the survey online if they no longer wish to take part at any time.
22 However, it will be clear in the introductory statement that data from questions already
23 completed may be analysed.
24
25
26
27
28

29 Administration

30
31 The survey will be administered via the online platform REDCap. (16) This electronic data
32 capture platform is fully compliant with Good Clinical Practice, 21 CFR Part 11, GDPR, 20 ISO
33 27001 and ISO 9001.14. It has stringent data security procedures and uses private servers.
34 Data will be held securely on secure online server hosted by the University of Bristol, UK.
35
36
37
38
39
40

41 Patient and Public Involvement

42
43 Staff wellbeing was rated the fourth highest priority of the James Lind Alliance Priority Setting
44 Partnership, [29] which involved extensive consultation with clinicians, patients, public and
45 carers. This study does not directly involve patients; however, the potential impact that
46 psychological trauma in doctors could have for patient care is concerning. Due to the urgency
47 and unprecedented nature of the current situation, patient and public involvement directly
48 related to this study has not been possible during the development of this protocol. It was
49 felt inappropriate to seek stakeholder engagement from doctors over the short study
50 development period as it could have detracted from pressing clinical demands.
51
52
53
54
55
56
57
58
59
60

Statistical Analysis Plan

Response Rate

This will be presented using the CHERRIES checklist specifications. (12) An overall response rate denominator will be reported using data provided by the General Medical Council (GMC) on doctors currently registered and working in ED, Anaesthetics and ICU in the UK. Estimates on the denominator for participants from Ireland will be reported using data provided by individual hospital departments on doctors working in the ED, Anaesthetics and ICU.

Analysis cohort (inclusion / exclusion criteria)

Non-consented, duplicate (by email address) and non-completion of the minimum required dataset for analysis (completion of GHQ-12, grade and hospital) will be excluded. Duplicates are handled as follows: where two or more email addresses are present, the most complete survey will be taken. Note that a complete survey may include unanswered questions.

The primary analysis cohort will comprise participants who have completed the GHQ-12 in all 3 surveys and the IES-R in surveys 2 and 3. Sub-analyses of completed surveys 1, 2, and 3, irrespective of completion of other survey, will also be reported.

Due to the difference in COVID-19 related policy between the Governments of the UK and Republic of Ireland, there may be a difference in timing of the pandemic wave. This could result in a significant difference of the study populations. Therefore, a study management group decision will be made, prior to final analysis, in regard to whether the difference of timing of the UK and Republic of Ireland's pandemic waves precludes joint analysis. Any decision will be documented in the final study report.

Descriptive Statistics

Descriptive statistics relating to participants' personal and professional characteristics will be presented overall and by department/geographic region.

GHQ-12 items will be analysed both individually and aggregated into an overall score using the 0-1-2-3 method. This method assigns responses to 0, 1, 2, 3 (positive to negative sentiment) producing a score in the range 0 to 36, with zero representing the most healthy response and 36 the most unhealthy. Note that for case identification, the 0-0-1-1 method is used (see outcome measures and Table 3).

IES-R responses will be analysed similarly, by assigning the responses to 0, 1, 2, 3, 4 (positive to negative) producing a score in the range 0 to 60.

The distribution of GHQ-12 and IES-R scores will be presented graphically, with an appropriate measure of central tendency and variation provided. Comparisons between different personal and professional characteristics will also be made. Distributional (median, Q1, Q3) and mean differences will be reported. Proportions of respondents meeting thresholds of clinically significant impairment will be derived for each of the psychometric measures, as outlined in Table 3.

These descriptive analyses will be performed for the primary analysis cohort and the survey-specific sub-cohorts. Participant dropout rates from survey one to surveys two and three will be reported.

Table 3 – Threshold scores for the GHQ-12 and IES-R

	Thresholds for clinical significance of each of the psychometric evaluations
GHQ-12 General Function	<ul style="list-style-type: none"> Above 3 on the 0-0-1-1 scoring system represents case level psychological distress
IES-R Trauma	<ul style="list-style-type: none"> 24 or above on the 0-1-2-3-4 scoring system represents clinically significant stress response

Inter-survey analysis

The models outlined are descriptive, with model parameters intended to summarise observed statistical relationships rather than estimating underlying causal effects. No formal

1
2
3 null hypothesis significance testing will be performed to determine the presence or absence
4 of statistically significant effect sizes, though p-values for model estimates will be reported
5 for reference.
6
7
8
9

10 *Change in the GHQ-12-score*

11
12
13 The change over time in the GHQ-12 score amongst participants who responded to all three
14 surveys will be examined. Graphical relationships between the trend in the GHQ-12 score and
15 variables collected at Phase 1 Survey will be presented.
16
17
18

19
20 A repeated measures non-linear mixed effect model will be deployed. The dependent
21 variable, GHQ score as measured on three consecutive occasions, is indexed either by
22 survey response date (in continuous-time) or by survey epidemic phase (before, during, and
23 after the epidemic peak). Models based on both indices will be investigated.
24
25
26

27 For the time-indexed model, a quadratic relationship between time and GHQ will be
28 permitted (given the potential for a rise then fall in GHQ-12 over the course of the
29 epidemic).
30
31
32

33
34
35 Region-level random-effects on the intercept and time will be included in both time- and
36 phase-indexed models, enabling regional differences in the modelled effect of phase/time
37 on GHQ and IES-R scores to be (partially) accounted for. Hospital-level random effects may
38 also be investigated, depending on the number of responses per hospital. Whilst hospital-
39 level random effects would more appropriately account for between-hospital heterogeneity
40 than region-level random effects, it is anticipated that some hospitals will only be
41 represented by only a very small number of participants, which may cause problems for
42 model identification.
43
44
45
46
47
48
49

50
51 To identify potential modifiers of GHQ-12-score change, further models each with a single
52 additional covariate will be built, with the likelihood ratio used to assess the degree of
53 improvement in the model.
54
55
56
57
58
59
60

Impact of Events Scale-Revised

The IES-R score amongst participants who responded to all three surveys will be examined. Graphical relationships between the IES-R score and variables collected at survey 1 will be presented.

A linear model will be deployed seeking to account for the variation in the IES-R score with survey 1 variables.

To identify potential pre-peak modifiers of IES-R-score (for instance to identify characteristics that put clinicians at higher risk of trauma following an epidemic), further models each with a single additional covariate will be built, and a likelihood ratio test performed to assess the improvement in the model. For Phase 3 models, the IES-R score from Phase 2 will also be included as a covariate.

Procedure for accounting for missing, unused and spurious data

Information on completeness for each variable will be reported. For the primary models, missing values will be imputed using multi-level fully conditional specification multiple imputation with 100 imputed datasets to be created. [30–32] For consistency, the same imputed datasets will be used across all models. Categorical variables will be imputed using multinomial logistic regression and ordinal variables using ordinal regression. The only continuous variables are GHQ-12 score and IES-R but these will be derived anew following imputation of the individual questions and will not be imputed directly. Imputation will not be necessary for region, grade, and specialty as these are complete by design due to the exclusion criteria. An “impute-then-delete” strategy will be employed for the dependent variable. Effect estimates across imputed datasets will be pooled using Rubin’s rules. [33]

Software

All analyses and statistical outputs will be produced in the statistical programming language R. The lme4 package will be used for the mixed-effects models.

Procedures for reporting any deviation(s) from the original statistical plan

Any requirement to deviate from the original statistical plan will be discussed with the Study Management Group and independently reviewed by an external statistician, where appropriate, and documented appropriately with a full explanation as to reasoning and requirement.

Data Storage

Data will be stored electronically for 5 years by the University Hospital of Bristol and Weston NHS Foundation Trust.

Ethics and Dissemination

Ethical Approval

This project has ethical approval from University of Bath, UK and Children's Health Ireland at Crumlin, Ethics Committee (Online Supplementary 2). Regulatory approval was obtained from the Health Regulation Authority (UK), Health and Care Research Wales (Online Supplementary 3).

Risk to participants

This survey collects potentially sensitive information, which will be handled in accordance with General Data Protection Regulations. This includes details on participants' baseline health status and psychometric evaluations of anxiety, depression and post-traumatic stress. It will be emphasised in the participant information sheet that such measures are non-diagnostic and that the purpose of the study is to monitor psychological wellbeing on a population level. As scales are being used for non-diagnostic purposes, feedback will not be provided to participants regarding their scores. Participants will be given the option to not disclose existing physical or mental health complaints with these questions listed as 'optional'. It is possible that questions relating to personal health and wellbeing may trigger emotive responses in participants. Participants will be signposted to suggested local and

1
2
3 national sources in the UK and Ireland where they may obtain support at the beginning and
4 end of each survey.
5
6
7
8
9

10 Risk to investigators

11
12
13 There are no anticipated additional risks to investigators as part of this study. The study may
14 generate media interest. All media releases will be conducted through the Sponsor and/or
15 publishing journals. Media interviews will be undertaken by a senior member of the study
16 group with media training.
17
18
19
20
21
22

23 Dissemination

24
25
26 Interim study reports will be prepared for public dissemination. On study completion a final
27 manuscript will be submitted to a peer reviewed scientific journal and shared with Medical
28 Royal Colleges to inform stakeholders of the pandemic impact upon this critical workforce.
29 The results will be disseminated widely at scientific conferences.
30
31
32
33
34

35 Discussion

36
37
38 This large-scale prospective longitudinal survey of frontline doctors builds on previous work
39 regarding psychological wellbeing in acute care settings and looks to assess the
40 psychological impact of the COVID-19 pandemic upon frontline doctors, specifically seeking
41 to understand key personal and professional factors which predict psychological distress in
42 this cohort. Findings will be discussed in relation to the current context and in light of the
43 reported impact of previous infectious disease outbreaks, aiming to contribute to novel data
44 on frontline doctors' mental health in a rapidly emerging field.
45
46
47
48
49
50
51

52
53 Concerns have been raised regarding the potential and likely negative psychological impact
54 of increasing workload in the already stretched ED clinical environment, with anticipation
55 that this will be exacerbated by the specific and significant challenges of work during the
56 COVID-19 pandemic. [34,35] In line with previous research, frontline healthcare workers
57 are likely to be affected by fears of contamination, disruption of normal supportive
58
59
60

1
2
3 structures and work stress. [36] However, there is a paucity of data to quantify these
4 effects. This collaborative research project, which harnesses the extensive reach of
5 research networks, and supported by national professional bodies (such as the Medical
6 Royal Colleges), seeks to address an important research question through rapid mobilisation
7 of existing research infrastructures. The immediate outputs of this work will aim to inform
8 the psychological response to this infection wave and future infection waves by robustly
9 assessing the degree of psychological distress and trauma in the frontline workforce,
10 furthermore gaining a greater understanding of the potentially modifiable personal and
11 professional factors that predict distress. Establishing need is imperative given that trauma
12 and psychological distress has been repeatedly demonstrated negative impact on
13 occupational performance, job satisfaction, physical and psychological. [37–39] By robustly
14 identifying predictive factors associated with mental health outcomes in this population,
15 targets for intervention will be provided; treatment for trauma and psychological distress is
16 evidence-based, efficacious and widely available on the NHS. [40] Recent advancements in
17 psychological therapy provision have expanded adaptations for the frontline staff
18 workforce, [41] however there is currently a lack knowledge concerning the precise
19 prevalence and degree of distress and what characterises those who are most affected. This
20 knowledge is essential to enable tailoring of support, treatment and pathways appropriate
21 to need. This research aims to address that gap and provide a foundation from which to
22 shape service development in order to improve outcomes in this critical workforce.
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40

41 The primary limitation to this work lies in estimating the peak phase, and therefore the
42 timepoint of maximal stress upon frontline doctors. This is reliant on national reporting and
43 may not reflect local or regional variations in systems pressure. However, given the high
44 response rate and sample size in the acceleration phase survey, it is planned to mitigate
45 regional effects through pre-defined subgroup analysis. Due to the rapidly developing
46 nature of the pandemic, constraints have prevented the gathering of qualitative data as part
47 of this study. Further research should explore the nature of distress in this population,
48 drawing out themes that would enhance depth of knowledge in this area. There is a risk of
49 selection bias through participant drop-out from survey 1 to surveys 2 and 3. To mitigate
50 against this the GHQ-12 and IES-R results for those who drop-out will be presented in the
51 final analysis.
52
53
54
55
56
57
58
59
60

1
2
3
4
5 A further limitation to this work is the lack of baseline level of distress or trauma in this
6 cohort prior to the COVID-19 pandemic. Work within the ED, ICU and anaesthetics is already
7 known to be challenging and impact of Doctors psychological health. [8,42,43] Results of
8 this study will be presented in the context of the existing literature predating the COVID-19
9 pandemic.
10
11
12
13
14
15

16 In conclusion, this longitudinal professional survey aims to robustly assess the psychological
17 impact of the COVID-19 pandemic on frontline doctors, using sequential assessment to
18 assess prevalence and degree of psychological distress across three key timepoints, defining
19 the nature of the relationship between key personal and professional factors and primary
20 outcomes of psychological distress and trauma response. This information will provide vital
21 understanding of the impact of the COVID-19 pandemic on healthcare and wellbeing
22 amongst clinical responders which will help tailor interventions and provide data for future
23 planning of psychological support.
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

References

- 1 Chen N, Zhou M, Dong X, *et al*. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet* 2020;**395**:507–13. doi:10.1016/S0140-6736(20)30211-7
- 2 Guan W, Ni Z, Hu Y, *et al*. Clinical Characteristics of Coronavirus Disease 2019 in China. *N Engl J Med* 2020;:NEJMoa2002032. doi:10.1056/NEJMoa2002032
- 3 Mahase E. China coronavirus: WHO declares international emergency as death toll exceeds 200. *BMJ* 2020;**368**:m408. doi:10.1136/bmj.m408
- 4 WHO Director-General’s opening remarks at the media briefing on COVID-19 - 11 March 2020. <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020> (accessed 31 Mar 2020).
- 5 Chang D, Xu H, Rebaza A, *et al*. Protecting health-care workers from subclinical coronavirus infection. *Lancet Respir. Med.* 2020;**8**:e13. doi:10.1016/S2213-2600(20)30066-7
- 6 Lai J, Ma S, Wang Y, *et al*. Factors Associated With Mental Health Outcomes Among Health Care Workers Exposed to Coronavirus Disease 2019. *JAMA Netw open* 2020;**3**:e203976. doi:10.1001/jamanetworkopen.2020.3976
- 7 What’s behind the A&E “crisis”? | The Nuffield Trust. <https://www.nuffieldtrust.org.uk/resource/what-s-behind-the-a-e-crisis> (accessed 31 Mar 2020).
- 8 Looseley A, Wainwright E, Cook TM, *et al*. Stress, burnout, depression and work satisfaction among <scp>UK</scp> anaesthetic trainees; a quantitative analysis of the Satisfaction and Wellbeing in Anaesthetic Training study. *Anaesthesia* 2019;**74**:1231–9. doi:10.1111/anae.14681
- 9 Bittner M-I, Donnelly M, van Zanten AR, *et al*. How is intensive care reimbursed? A review of eight European countries. *Ann Intensive Care* 2013;**3**:37. doi:10.1186/2110-5820-3-37
- 10 Ferguson N, Laydon D, Nedjati- Gilani G *et al*. Impact of non-pharmaceutical interventions (NPIs) to reduce COVID19 mortality and healthcare demande. Published Online First: 2020.<https://www.imperial.ac.uk/media/imperial->

- college/medicine/sph/ide/gida-fellowships/Imperial-College-COVID19-NPI-modelling-16-03-2020.pdf
- 11 Naushad VA, Bierens JJLM, Nishan KP, *et al.* A Systematic Review of the Impact of Disaster on the Mental Health of Medical Responders. *Prehosp. Disaster Med.* 2019;**34**:632–43. doi:10.1017/S1049023X19004874
- 12 Lin CY, Peng YC, Wu YH, *et al.* The psychological effect of severe acute respiratory syndrome on emergency department staff. *Emerg Med J* 2007;**24**:12–7. doi:10.1136/emj.2006.035089
- 13 Brooks SK, Dunn R, Sage CAM, *et al.* Risk and resilience factors affecting the psychological wellbeing of individuals deployed in humanitarian relief roles after a disaster. *J. Ment. Heal.* 2015. doi:10.3109/09638237.2015.1057334
- 14 Brooks SK, Dunn R, Amlôt R, *et al.* A Systematic, Thematic Review of Social and Occupational Factors Associated with Psychological Outcomes in Healthcare Employees during an Infectious Disease Outbreak. *J Occup Environ Med* Published Online First: 2018. doi:10.1097/JOM.0000000000001235
- 15 Lancee WJ, Maunder RG, Goldbloom DS. Prevalence of psychiatric disorders among Toronto hospital workers one to two years after the SARS outbreak. *Psychiatr Serv* Published Online First: 2008. doi:10.1176/ps.2008.59.1.91
- 16 Maunder RG, Lancee WJ, Rourke S, *et al.* Factors associated with the psychological impact of severe acute respiratory syndrome on nurses and other hospital workers in Toronto. *Psychosom. Med.* 2004. doi:10.1097/01.psy.0000145673.84698.18
- 17 Ozer EJ, Best SR, Lipsey TL, *et al.* Predictors of posttraumatic stress disorder and symptoms in adults: A meta-analysis. *Psychol. Bull.* 2003;**129**:52–73. doi:10.1037/0033-2909.129.1.52
- 18 Brooks SK, Webster RK, Smith LE, *et al.* The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *Lancet.* 2020. doi:10.1016/S0140-6736(20)30460-8
- 19 Jones NM, Thompson RR, Schetter CD, *et al.* Distress and rumor exposure on social media during a campus lockdown. *Proc Natl Acad Sci U S A* Published Online First: 2017. doi:10.1073/pnas.1708518114
- 20 Torales J, O'Higgins M, Castaldelli-Maia JM, *et al.* The outbreak of COVID-19 coronavirus and its impact on global mental health. *Int J Soc Psychiatry*

- 2020;:002076402091521. doi:10.1177/0020764020915212
- 21 Holloway R, Rasmussen SA, Zaza S, *et al.* Updated Preparedness and Response
22 Framework for Influenza Pandemics.
23 2014. <https://www.cdc.gov/mmwr/preview/mmwrhtml/rr6306a1.htm> (accessed 8
24 Apr 2020).
- 25 Goldberg D, Williams P. *A user's guide to the General Health Questionnaire*. London: :
26 GL Assessment 1988.
- 27 Goldberg DP, Gater R, Sartorius N, *et al.* The validity of two versions of the GHQ in the
28 WHO study of mental illness in general health care. *Psychol Med* Published Online
29 First: 1997. doi:10.1017/S0033291796004242
- 30 Goldberg DP, Oldehinkel T, Ormel J. Why GHQ threshold varies from one place to
31 another. *Psychol Med* Published Online First: 1998. doi:10.1017/S0033291798006874
- 32 Burbeck R, Coomber S, Robinson SM, *et al.* Occupational stress in consultants in
33 accident and emergency medicine: A national survey of levels of stress at work.
34 *Emerg Med J* 2002;**19**:234–8. doi:10.1136/emj.19.3.234
- 35 Horowitz M, Wilner N, Alvarez W. Impact of event scale: A measure of subjective
36 stress. *Psychosom Med* Published Online First: 1979. doi:10.1097/00006842-
37 197905000-00004
- 38 Coronavirus (COVID-19) in the UK.
39 <https://coronavirus.data.gov.uk/#category=regions&map=rate> (accessed 17 Jun
40 2020).
- 41 Eysenbach G. Improving the Quality of Web Surveys: The Checklist for Reporting
42 Results of Internet E-Surveys (CHERRIES). *J Med Internet Res* 2004;**6**:e34.
43 doi:10.2196/jmir.6.3.e34
- 44 Smith J, Keating L, Flowerdew L, *et al.* An Emergency Medicine Research Priority
45 Setting Partnership to establish the top 10 research priorities in emergency medicine.
46 *Emerg Med J* Published Online First: 2017. doi:10.1136/emered-2017-206702
- 47 Marshall A, Altman DG, Holder RL, *et al.* Combining estimates of interest in prognostic
48 modelling studies after multiple imputation: Current practice and guidelines. *BMC*
49 *Med Res Methodol* Published Online First: 2009. doi:10.1186/1471-2288-9-57
- 50 M.H. H, J.B. C, J.A. S, *et al.* A comparison of multiple imputation methods for missing
51 data in longitudinal studies. *BMC Med Res Methodol* Published Online First: 2018.

- 1
2
3 doi:10.1186/s12874-018-0615-6 LK - http://emory-primoprod.hosted.exlibrisgroup.com/openurl/01EMORY/01EMORY_services_page?sid=EMBASE&issn=14712288&id=doi:10.1186%2Fs12874-018-0615-6&atitle=A+comparison+of+multiple+imputation+methods+for+missing+data+in+longitudinal+studies&stitle=BMC+Med+Res+Methodol&title=BMC+medical+research+methodology&volume=18&issue=1&spage=168&epage=&aulast=Huque&aufirst=Md+H amidul&aunit=M.H.&aufull=Huque+M.H.&coden=&isbn=&pages=168-&date=2018&aunit1=M&aunitm=H
- 4
5
6
7
8
9
10
11
12
13
14
15
16
17
18 32 Grund S, Lüdtke O, Robitzsch A. Multiple Imputation of Missing Data for Multilevel
19 Models. *Organ Res Methods* 2018;**21**:111–49. doi:10.1177/1094428117703686
- 20
21 33 von Hippel PT. 4. Regression with Missing Ys: An Improved Strategy for Analyzing
22 Multiply Imputed Data. *Sociol Methodol* 2007;**37**:83–117. doi:10.1111/j.1467-
23 9531.2007.00180.x
- 24
25
26
27 34 Godlee F. Covid-19: weathering the storm. *BMJ* 2020;**368**:m1199.
28 doi:10.1136/bmj.m1199
- 29
30
31 35 BMA survey finds doctors' lives still at risk despite PPE pledges.
32 <https://www.bma.org.uk/news-and-opinion/bma-survey-finds-doctors-lives-still-at-risk-despite-government-pledges-on-ppe> (accessed 23 Apr 2020).
- 33
34
35
36 36 Holmes EA, O'Connor RC, Perry VH, *et al.* Multidisciplinary research priorities for the
37 COVID-19 pandemic: a call for action for mental health science. *The Lancet Psychiatry*
38 2020;**0**. doi:10.1016/S2215-0366(20)30168-1
- 39
40
41 37 Maunder RG, Lancee WJ, Balderson KE, *et al.* Long-term psychological and
42 occupational effects of providing hospital healthcare during SARS outbreak. *Emerg*
43 *Infect Dis* Published Online First: 2006. doi:10.3201/eid1212.060584
- 44
45
46
47 38 Arora M, Asha S, Chinnappa J, *et al.* Review article: Burnout in emergency medicine
48 physicians. *EMA - Emerg. Med. Australas.* 2013;**25**:491–5. doi:10.1111/1742-
49 6723.12135
- 50
51
52
53 39 Fiksenbaum L, Marjanovic Z, Greenglass ER, *et al.* Emotional exhaustion and state
54 anger in nurses who worked during the sars outbreak: The role of perceived threat
55 and organizational support. *Can J Community Ment Heal* Published Online First: 2006.
56 doi:10.7870/cjcmh-2006-0015
- 57
58
59
60 40 Pilling S, Whittington C, Taylor C, *et al.* Identification and care pathways for common

- 1
2
3 mental health disorders: Summary of NICE guidance. *BMJ*. 2011;**342**.
4 doi:10.1136/bmj.d2868
5
6
7 41 The psychological needs of healthcare staff as a result of the Coronavirus pandemic. |
8 BPS. [https://www.bps.org.uk/news-and-policy/psychological-needs-healthcare-staff-](https://www.bps.org.uk/news-and-policy/psychological-needs-healthcare-staff-result-coronavirus-pandemic)
9 [result-coronavirus-pandemic](https://www.bps.org.uk/news-and-policy/psychological-needs-healthcare-staff-result-coronavirus-pandemic) (accessed 23 Apr 2020).
10
11
12 42 Schneider A, Weigl M. Associations between psychosocial work factors and provider
13 mental well-being in emergency departments: A systematic review. *PLoS One*.
14 2018;**13**. doi:10.1371/journal.pone.0197375
15
16
17 43 Rotenstein LS, Torre M, Ramos MA, *et al*. Prevalence of burnout among physicians a
18 systematic review. *JAMA - J. Am. Med. Assoc.* 2018;**320**:1131–50.
19
20
21 doi:10.1001/jama.2018.12777
22
23
24
25

26 Acknowledgements

27
28 The views expressed are those of the authors and not necessarily those of the NHS, the
29 NIHR, the Department of Health or the Royal Colleges involved in survey distribution.
30
31 The authors would like to acknowledge Mai Baquedano, at the University of Bristol, for her
32 support with REDCap. The authors would finally like to acknowledge GL Assessments for
33 providing the licence for the GHQ-12 free of charge.
34
35
36
37
38
39

40 Author Contributions

41
42 Tom Roberts (TR) conceived the idea for the study. TR, Edd Carlton (EC), Jo Daniels (JD),
43 Mark Lyttle (ML), Daniel Horner (DH) and Blair Graham (BG) were responsible for the initial
44 study design, which was refined with the help of Katie Samuel (KS), Charles Reynard (CR),
45 Robert Hirst (RH), Michael Barrett (MB) and William Hulme (WH). Expert advice on
46 psychological assessment scores was provided by JD. WH provided the statistical plan. TR
47 lead the dissemination of the study in UK Adult Emergency Departments (ED), ML lead the
48 dissemination of the study in UK and Ireland Paediatric EDs, KS lead the dissemination of the
49 study in UK Anaesthetic and ICU Departments, MB lead the dissemination of the study in
50 Ireland EDs, ICUs and Anaesthetic Departments. TR coordinated study set-up, finalisation of
51 the study surveys and finalisations of study protocols. All authors contributed to the final
52
53
54
55
56
57
58
59
60

1
2
3 study design and protocol development, critically revised successive drafts of the
4 manuscript and approved the final version. The study management group is responsible for
5 the conduct of the study.
6
7
8
9

10 11 Funding

12
13 The study has been awarded a competitive grant by the Royal College of Emergency Medicine
14 (G/2020/1). The Survey platform is provided courtesy of University of Bristol. The chief
15 investigator is directly funded as a research fellow by the Royal College of Emergency
16 Medicine. The GHQ-12 is being used under licence from GL assessments; the fee for use of
17 this instrument within all three surveys has been waived. Dr Carlton is a National Institute for
18 Health Research Advanced Fellow.
19
20
21
22
23
24
25
26

27 Competing Interests

28
29 Many of the authors have been working as frontline clinicians during the COVID-19 pandemic.
30 They have no competing interests to declare.
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

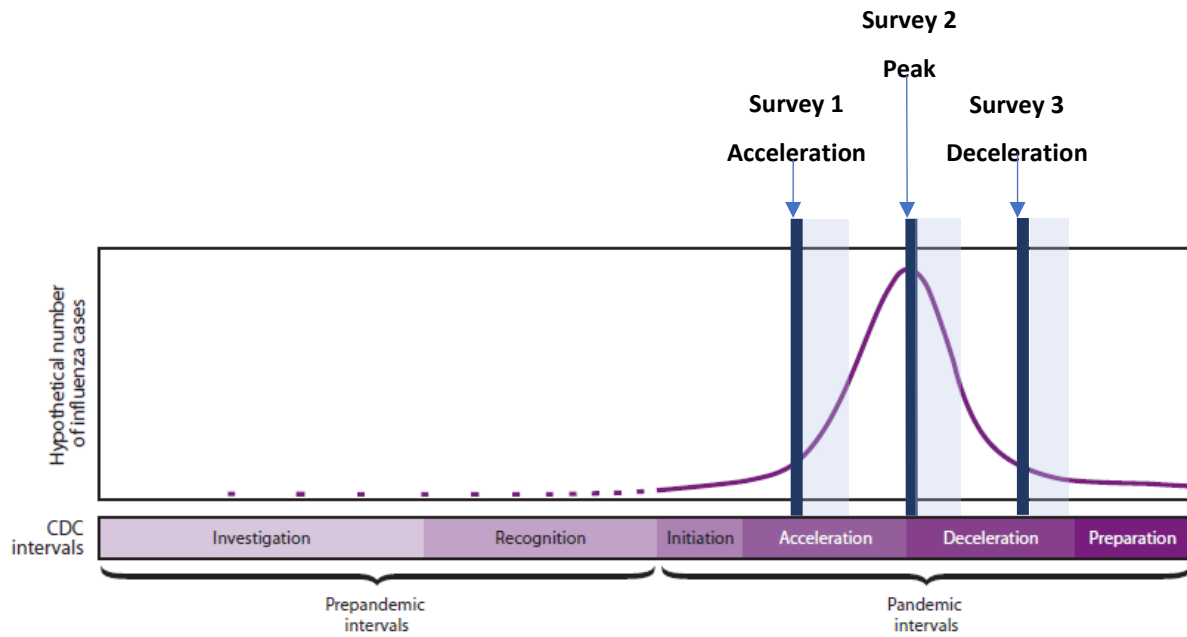


Figure 1. Timing of Surveys in accordance with pandemic preparedness model. Solid blue line represents date of survey issue, transparent blue area represents data collection period (As adapted from the CDC (21))

Online supplementary 1. CERA Survey 1 Questions

Field Label	Choices, Calculations, OR Slider Labels
Do you want to read the participant information sheet now?	
If you would like to download the patient information sheet to read later, please download the link below.	
By checking this box, I certify that I am at least 18 years old and that I give my consent freely to participate in this study.	1, I consent
What is your e-mail address? (This will only be used for the delivery of survey 2 + 3, which you will receive over the coming months)	
What is the name of the Hospital where you work?	
You have selected other, please specify.	
What is your professional grade?	17, GP Trainee 1, ST1 2, ST2 3, ST3 4, ST4 5, ST5 6, ST6 7, ST7 8, ST8 9, F1 10, F2 11, Clinical Fellow (F2-ST3 Level) 12, Clinical Fellow (>=ST4 Level) 13, Consultant 14, Associate Specialist 15, Staff Grade 16, CESR Doctor 18, GP 19, Other
You have selected other, please specify.	
What is your gender?	1, Male 2, Female 3, Other 4, Prefer not to say
How old are you?	1, 20-25 2, 26-30 3, 31-35 4, 36-40 5, 41-45 6, 46-50 7, 51-55 8, 56-60 9, 61-65 10, 66-70 11, >70
What is your 'parent speciality'?	1, Emergency Medicine 2, Anaesthetics 3, Intensive Care Medicine 9, Paediatrics 4, General Practice 5, Surgery 6, Foundation Programme 7, Acute Internal Medicine 8, Other
What is your 'parent speciality'?	1, Emergency Medicine 2, Anaesthetics 3, Intensive Care Medicine 9, Paediatrics 4, General Practice 5, Surgery 6, Foundation Programme 7, Acute Internal Medicine 8, Other
You have selected other, please specify.	
<div class="rich-text-field-label"><p>In what Department were you working as of March 1st 2020?</p></div>	1, Emergency Department (adult or paediatric) 2, Anaesthetic Department (adult or paediatric) 3, Intensive Care Department (adult or paediatric) 5, Acute Medical Unit 6, Hospital ward (adult or paediatric) 4, Other
<div class="rich-text-field-label"><p>In what Department were you working as of March 1st 2020?</p> <p>Select all that apply</p></div>	1, Emergency Department (adult or paediatric) 2, Anaesthetic Department (adult or paediatric) 3, Intensive Care Department (adult or paediatric) 5, Acute Medical Unit 6, Hospital ward (adult or paediatric) 4, Other
<div class="rich-text-field-label"><p>You selected other, in which Department where you working as of March 1st 2020?</p></div>	
Have you been deployed to a different clinical area as a result of the COVID-19 outbreak?	
Where have you been redeployed to?	1, Emergency Department (adult or paediatric) 2, Anaesthetic Department (adult or paediatric) 3, Intensive Care Department (adult or paediatric) 5, Acute Medical Unit 6, Hospital ward (adult or paediatric) 4, Other
You have selected other, please specify.	

How satisfied are you with this redeployment?	1, Very dissatisfied 2, Somewhat dissatisfied 5, Neither satisfied nor dissatisfied 3, Somewhat satisfied 4, Very satisfied
Have you previously provided direct clinical care to any patients affected by these infectious disease outbreaks? (please select all that apply)	0, None of the below 4, Ebola virus 10, MERS-CoV 16, SARS 1, Chikungunya 2, Cholera 6, Influenza (swine, avian, zoonotic) 20, Zika virus 21, Other
GHQ-12 Survey – For copyright reasons the questions have been removed. Please see the below for the general domains of questions	
Concentration	1, Better 2, Same 3, Less 4, Much less
Sleep	1, Better 2, Same 3, Less 4, Much less
Playing a part in things	1, Better 2, Same 3, Less 4, Much less
Decision making	1, Better 2, Same 3, Less 4, Much less
Strain	1, Better 2, Same 3, Less 4, Much less
Overcoming difficulties	1, Better 2, Same 3, Less 4, Much less
Enjoy of activities	1, Better 2, Same 3, Less 4, Much less
Facing problems	1, Better 2, Same 3, Less 4, Much less
Feelings of unhappiness or depression	1, Better 2, Same 3, Less 4, Much less
Confidence	1, Better 2, Same 3, Less 4, Much less
Feelings of worthlessness	1, Better 2, Same 3, Less 4, Much less
Happiness	1, Better 2, Same 3, Less 4, Much less
<p><div class="rich-text-field-label"><p>For the above 12 questions the following applies: All rights reserved. This work may not be reproduced by any means, even within the terms of a Photocopying Licence, without the written permission of the publisher. Photocopying without permission may result in legal action. Published by GL Assessment Limited 1st Floor Vantage London, Great West Road, Brentford TW8 9AG This edition published 1992. GL Assessment is part of GL Education. www.gl-assessment.co.uk. David Goldberg, 1978 <strong style="font-family: Calibri, sans-serif; font-size: 14.666666984558105px;">General Health Questionnaire© (GHQ12). </p></div></p>	
Donning and doffing (gloves, gown, facemask, eye protection)	1, No training 2, Formal instructional video 3, Written instruction 4, Simulation training 5, Departmental guidance 6, Other
Formal fit testing for mask	1, No training 2, Formal instructional video 3, Written instruction 4, Simulation training 5, Departmental guidance 6, Other
PPE training for exposure to aerosol generating procedure (e.g. intubation)	1, No training 2, Formal instructional video 3, Written instruction 4, Simulation training 5, Departmental guidance 6, Other
Other. Please specify.	
If you have had any further PPE training please specify	
What practical education have you received in regards to the clinical care of patients presenting with suspected/diagnosed COVID-19?	0, None 1, Simulation training of a possible case 2, Simulation training of a case requiring aerosol procedure 3, Other
You selected other. Please specify.	
Government Guidance	1, Hourly 2, Up to twice a day 3, Daily 4, Several times a week 5, Weekly 6, Less than weekly 7, Never

College Guidance	1, Hourly 2, Up to twice a day 3, Daily 4, Several times a week 5, Weekly 6, Less than weekly 7, Never
Trust Guidance	1, Hourly 2, Up to twice a day 3, Daily 4, Several times a week 5, Weekly 6, Less than weekly 7, Never
Departmental guidance	1, Hourly 2, Up to twice a day 3, Daily 4, Several times a week 5, Weekly 6, Less than weekly 7, Never
Social Media	1, Hourly 2, Up to twice a day 3, Daily 4, Several times a week 5, Weekly 6, Less than weekly 7, Never
Online blogs and podcasts	1, Hourly 2, Up to twice a day 3, Daily 4, Several times a week 5, Weekly 6, Less than weekly 7, Never
Peer review literature	1, Hourly 2, Up to twice a day 3, Daily 4, Several times a week 5, Weekly 6, Less than weekly 7, Never
How confident do you feel in the infection control training that has been provided to you?	1, Not confident at all 2, Somewhat not confident 3, Somewhat confident 4, Very confident
How prepared do you feel to provide direct care to suspected cases?	1, Completely unprepared 2, Somewhat unprepared 3, Somewhat prepared 4, Very prepared
How do you feel the care received by patients who are NOT presenting with either symptoms or a diagnosis of COVID-19 is?	1, Significantly worse than before Covid-19 2, Slightly worse than before Covid-19 3, The same as before Covid-19 4, Slightly better than before Covid-19 5, Significantly better than before Covid-19
How many suspected cases of COVID-19 have you had direct clinical contact with since March 1st 2020?	0, 0 1, 1-5 2, 6-10 3, 11-15 4, 16-20 5, 21-25 6, 26-30 7, 31-35 8, > 36
As far as you are aware, how many of these suspected cases have turned out to be confirmed cases of COVID-19?	0, 0 1, 1-5 2, 6-10 3, 11-15 4, 16-20 5, 21-25 6, 26-30 7, 31-35 8, > 36
Are you concerned that the exposure to the COVID-19 outbreak may increase symptoms of any established medical health conditions?	0, Yes 1, No 2, Prefer not to disclose 3, I do not have an established medical condition
Are you concerned that the exposure to the COVID-19 outbreak may increase symptoms of any established mental health conditions?	0, Yes 1, No 2, Prefer not to disclose 3, I do not have an established mental health condition
I feel that my personal health is at risk during the COVID-19 outbreak due to my clinical role?	1, Strongly disagree 2, Disagree 3, Neither agree nor disagree 4, Agree 5, Strongly agree
How worried are you about the potential risks if you were to become infected with COVID-19?	1, Extremely worried 2, Generally worried 3, Generally not worried 4, Not worried at all
How worried are you about the potential risks to your family, loved ones or others due to your clinical role in the COVID-19 outbreak?	1, Extremely worried 2, Generally worried 3, Generally not worried 4, Not worried at all
Have you had to self-isolate?	
For what reason did you have to self-isolate?	1, Personal symptoms 2, Symptoms of a member of the household 3, Exposure to a positive case of COVID-19 in the work environment 4, Exposure to a positive case of COVID-19 in your personal environment 5, Personal diagnosis of COVID-19 6, Other (eg return from travel to high risk area)
Other - please specify	
How many clinical shifts in your rota have you missed due to self-isolation?	0, 0 1, 1 2, 2 3, 3 4, 4 5, 5-7 6, 8-10 7, >10
Date survey completed	
This is part 2 of the CERA survey. Thank you for taking the time to fill out the questions below.	
I have felt well supported by friends and family over the past two weeks (ie. since the national peak of the pandemic)?	1, Strongly disagree 2, Disagree 3, Agree 4, Strongly agree

<p><div class="rich-text-field-label"><p>I have felt well supported by colleagues over the past two weeks (ie. since the national peak of the pandemic) </p></div></p>	<p>1, Strongly disagree 2, Disagree 5, Neither agree nor disagree 3, Agree 4, Strongly agree</p>
<p><div class="rich-text-field-label"><p>During the COVID-19 pandemic, I have felt at personal high risk of dying/death?</p></div></p>	<p>1, Yes 2, No</p>
<p><div class="rich-text-field-label"><p>During the COVID-19 pandemic, I have witnessed the death of COVID-19 patients.</p></div></p>	<p>1, Yes 2, No</p>
<p><div class="rich-text-field-label"><p>Over the course of your life, have you experienced what you would characterise as a trauma?</p></div></p>	<p>1, Yes 2, No</p>
<p><div class="rich-text-field-label"><p>In the last two weeks I have experiences strong feelings of guilt, shame or helplessness as a consequence to my experience of working with COVID-19?</p></div></p>	<p>1, Strongly disagree 2, Disagree 5, Neither agree nor disagree 3, Agree 4, Strongly agree</p>
<p><div class="rich-text-field-label"><p>Have you had any loved ones receive intensive care treatment or die due to COVID-19 infection?</p></div></p>	<p>1, Yes 2, No</p>
<p><div class="rich-text-field-label"><p>Have you had any colleagues receive intensive care treatment or die due to COVID-19 infection?</p></div></p>	<p>1, Yes 2, No</p>
<p><div class="rich-text-field-label"><p>We should like to know if you have had any medical complaints, and how your health has been in general, over the past few weeks.
Please answer ALL the questions simply by selecting the answer which you think most nearly applies to you. Remember that we want to know about present and recent complaints, not those you had in the past. It is important that you try to answer ALL the questions.</p></div></p>	
<p>Been able to concentrate on whatever you're doing?</p>	<p>1, Better than usual 2, Same as usual 3, Less than usual 4, Much less than usual</p>
<p>Lost much sleep over worry?</p>	<p>1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual</p>
<p>Felt that you are playing a useful part in things?</p>	<p>1, More so than usual 2, Same as usual 3, Less useful than usual 4, Much less useful</p>
<p>Felt capable of making decisions about things?</p>	<p>1, More so than usual 2, Same as usual 3, Less so than usual 4, Much less capable</p>
<p>Felt constantly under strain?</p>	<p>1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual</p>
<p>Felt you couldn't overcome your difficulties?</p>	<p>1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual</p>
<p>Been able to enjoy your normal day-to-day activities?</p>	<p>1, More so than usual 2, Same as usual 3, Less so than usual 4, Much less than usual</p>
<p>Been able to face up to your problems?</p>	<p>1, More so than usual 2, Same as usual 3, Less able than usual 4, Much less able</p>

1 2 3 4 5 6 7 8 9	Been feeling unhappy and depressed?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
10 11 12 13 14 15 16	Been losing confidence in yourself?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
17 18 19 20 21 22 23 24 25	Been thinking of yourself as a worthless person?	1, Not at all 2, No more than usual 3, Rather more than usual 4, Much more than usual
26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59	Been feeling reasonably happy, all things considered?	1, More so than usual 2, About the same as usual 3, Less so than usual 4, Much less than usual
	Below is a list of difficulties people sometimes have after stressful life events. Please read each item, and then indicate how distressing each difficulty has been for you DURING THE PAST SEVEN DAYS with respect to the PEAK of the COVID-19 pandemic that occurred on _____. How much have you been distressed or bothered by these difficulties?	
	Any reminder brought back feelings about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
	I had trouble staying asleep	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
	Other things kept me thinking about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
	I felt irritable and angry	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
	I avoided letting myself get upset when I thought about it or was reminded of it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
	I thought about it when I didn't mean to	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
	I felt as if it hadn't happened or wasn't real	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
	I stayed away from reminders of it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
	Pictures about it popped into my head	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
	I was jumpy and easily startled	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
	I tried not to think about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
	I was aware that I still had a lot of feelings about it, but I didn't deal with them	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
	My feelings about it were kind of numb	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
	I found myself acting or feeling like I was back at that time	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
	I had trouble falling asleep	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
	I had waves of strong feelings about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
	I tried to remove it from my memory	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
	I had trouble concentrating	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
	Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea or a pounding heart	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
	I had dreams about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely

I felt watchful and on-guard	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I tried not to talk about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
Any reminder brought back feelings about it?	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I had trouble staying asleep	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
Other things kept me thinking about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I felt irritable and angry	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I avoided letting myself get upset when I thought about it or was reminded of it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I thought about it when I didn't mean to	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I felt as if it hadn't happened or wasn't real	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I stayed away from reminders of it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
Pictures about it popped into my mind	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I was jumpy and easily startled	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I tried not to think about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I was aware that I still had a lot of feelings about it, but I didn't deal with them	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
My feelings about it were kind of numb	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I found myself acting or feeling like I was back at that time	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I had trouble falling asleep	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I had waves of strong feelings about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I tried to remove it from my memory	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I had trouble concentrating	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea or a pounding heart	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I had dreams about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I felt watchful and on-guard	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
I tried not to talk about it	1, Not at all 2, A little bit 3, Moderately 4, Quite a bit 5, Extremely
On average, how many pills did you take each day last week?	0, Less than 5 1, 5-10 2, 6-15 3, Over 15
Using the handout, which level of dependence do you feel you are currently at?	0, 0 1, 1 2, 2 3, 3 4, 4 5, 5

The choices you made	1, Not satisfied at all 2, Somewhat dissatisfied 3, Indifferent 4, Somewhat satisfied 5, Very satisfied
Your life overall	1, Not satisfied at all 2, Somewhat dissatisfied 3, Indifferent 4, Somewhat satisfied 5, Very satisfied
Your job	1, Not satisfied at all 2, Somewhat dissatisfied 3, Indifferent 4, Somewhat satisfied 5, Very satisfied
Your family life	1, Not satisfied at all 2, Somewhat dissatisfied 3, Indifferent 4, Somewhat satisfied 5, Very satisfied

Online Supplementary 2. Ethical Approval

Received 16th March 2020

This Ethics Form has now been signed off by the HoD.

Please click [here](#) to open **Fom No: 4421**

No further action is required. To see all the forms signed off, please click on the link above.

Please click [here](#) to view **All your Approved Ethics Forms.**

If you require any assistance or need to report a technical fault or issue with the form please refer to the following contact details:

Ethics Form: Technical Issues, Procedures & Suggestions:- ethics@lists.bath.ac.uk

Ethics Form: Urgent Technical Issues: c.j.cooper@bath.ac.uk

review only



Children's Health Ireland
at Crumlin

Stáinte Leanaí Éireann (SLÉ) ag Cromghlinn, D12 N512, Éire
Children's Health Ireland (CHI) at Crumlin, D12 N512, Ireland
T + 353 (0) 1 409 6100 | F + 353 (0) 1 455 8873 | www.olchc.ie
Cosc ar úsáid d'oidis leighis | Not for prescription purposes

ETHICS (MEDICAL RESEARCH) COMMITTEE OFFICE

Tel: +353 (01) 409 6307/6243

A/Professor Michael Barrett
Consultant in Paediatric Emergency Medicine
Children's Health Ireland (CHI) at Crumlin
Dublin D12 N512

24th March 2020

REC Reference: GEN/806/20

The COVID-19 Emergency Response Assessment Survey
Principal Investigator: A/Professor Michael Barrett

Dear Professor Barrett

The Ethics (Medical Research) Committee at this hospital reviewed and approved the above Study.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Claire Rice'.

Claire Rice
Secretary
Ethics (Medical Research) Committee

Online Supplementary 3. HRA and Health and Care Research Wales, Approval



Dr Tom Roberts
TERN Fellow
Royal College of Emergency Medicine
7-9 Bream Buildings
London
EC4A 1DT

Email: approvals@hra.nhs.uk
HCRW.approvals@wales.nhs.uk

18 March 2020

Dear Dr Roberts

**HRA and Health and Care
Research Wales (HCRW)
Approval Letter**

Study title: COVID-19 Emergency Response Assessment (CERA)
IRAS project ID: 281944
Protocol number: Protocol 1.
REC reference: 20/HRA/1500
Sponsor: North Bristol NHS Trust

I am pleased to confirm that [HRA and Health and Care Research Wales \(HCRW\) Approval](#) has been given for the above referenced study, on the basis described in the application form, protocol, supporting documentation and any clarifications received. You should not expect to receive anything further relating to this application.

Please now work with participating NHS organisations to confirm capacity and capability, [in line with the instructions provided in the "Information to support study set up" section towards the end of this letter.](#)

How should I work with participating NHS/HSC organisations in Northern Ireland and Scotland?

HRA and HCRW Approval does not apply to NHS/HSC organisations within Northern Ireland and Scotland.

If you indicated in your IRAS form that you do have participating organisations in either of these devolved administrations, the final document set and the study wide governance report (including this letter) have been sent to the coordinating centre of each participating nation. The relevant national coordinating function/s will contact you as appropriate.