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1       **EVALUATION OF A PERSONAL PROTECTIVE EQUIPMENT (PPE)**  
2  
3       **SUPPORT PROGRAMME ('PPE HELPERS') FOR STAFF DURING**  
4  
5       **THE COVID-19 PANDEMIC IN LONDON**  
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56       **Running title:** COVID-19 PPE Helpers evaluation  
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## Structured summary

**Background:** The COVID-19 pandemic has presented one of the biggest challenges to healthcare providers worldwide. The appropriate use of Personal Protective Equipment (PPE) has been essential to ensuring staff and patient safety. To counteract sub-optimal PPE practice, a PPE helper programme was developed at a large London hospital group. Based on a behaviour change model of Capability, Opportunity and Motivation (COM-B), the programme provided PPE support, advice and education to ward staff.

**Aim:** Evaluation of the PPE Helper Programme.

**Methods:** Clinical and non-clinical ward staff completed a questionnaire informed by the Theoretical Domains Framework and COM-B. The questionnaire was available in paper and electronic versions. Quantitative responses were analysed using descriptive and non-parametric statistics, free-text responses were analysed thematically.

**Findings:** Over a six-week period, PPE helpers made 268 ward visits. Overall, 261 questionnaires were available for analysis. Across the Trust, 68% of respondents reported having had contact with a PPE helper. Staff who had encountered a PPE helper responded significantly more positively to a range of statements about using PPE than those who had not. Black and Minority Ethnic (BAME) staff were significantly more anxious in relation to the adequacy of PPE. Non-clinical and redeployed staff (e.g. domestic staff) were most positive about the impact of PPE helpers. Free-text comments showed that staff found the programme supportive and would have liked it earlier in the pandemic.

**Conclusion:** A PPE Helper programme is a feasible and beneficial intervention for providing support, advice and education to ward staff during infectious disease outbreaks.

**Keywords:** Infection prevention control, PPE, COVID-19, staff survey

## Introduction

1 During the first wave of the COVID-19 pandemic, the UK was one of the worst affected  
2 countries in the world [1], with more than 57,000 COVID-19 related deaths recorded by mid-  
3 September 2020.[2] The pandemic has presented one of the biggest challenges in recent  
4 history to healthcare providers worldwide. The infectious nature of the SARS-CoV-2 virus[3]  
5 means that the careful use of Personal Protective Equipment (PPE) is vital to ensure staff  
6 and patient safety. The availability and use of PPE across the health and social care system  
7 has been one of the most controversial aspects of COVID-19.[4] Deaths in health and social  
8 care professionals have been high, with increasing evidence that staff from black and  
9 minority ethnic (BAME) groups have experienced significantly worse outcomes.[5] Many  
10 affected families have blamed the UK government for shortages of PPE.[6] Early in the  
11 pandemic, Public Health England (PHE) published guidance [7] based on the best evidence  
12 [8] available, on: PPE needed for different clinical situations; donning and doffing procedures  
13 to protect against self-contamination; and the value of education and training to improve  
14 PPE practice in clinical settings.

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Equipping staff to use PPE safely was an unprecedented challenge to health and social care systems. Complex messages had to be conveyed appropriately to staff, within a context of high anxiety and significant clinical pressure. Incorrect or over-use of PPE is a risk for cross-transmission (patient-patient;[9] patient-staff; staff-patient) and self-inoculation [10]. Changes in guidance over time, and differences in recommended protection for different countries and transmission routes (i.e., contact, droplet, airborne), all extended the challenge facing UK hospitals during COVID-19.

Within the first four months of the outbreak, one of the largest acute and specialist hospital groups in London (Imperial College Healthcare NHS Trust) cared for 1328 patients who tested positive for the SARS-CoV-2 virus that causes COVID-19. The Infection Prevention and Control (IPC) team were observing sub-optimal PPE practice across the Trust, which risked compromising staff and patient safety. It was recognised that regular communication and information about PPE was insufficient to support behaviour change. Therefore, the IPC team, in conjunction with improvement experts, developed a model of PPE support based on behaviour change theory. This paper describes the evaluation of the 'PPE Helper Programme'. Lessons learned may help prepare for further COVID-19 surges or other outbreaks of infectious disease.

## Methods

### *Development of the PPE Helper Programme*

The PPE Helper programme adopted core improvement principles and was underpinned by the COM-B model [11] which proposes that there are three components to any behaviour (B): Capability (C), Opportunity (O) and Motivation (M). To perform a particular behaviour, a person must feel psychologically and physically able (C), have the social and physical opportunity (O), and want or need to carry out the behaviour more than other competing behaviours (M).

Our starting assumption in designing the PPE Helper Programme was that staff would want to use PPE correctly to ensure their safety, but that many factors might get in the way. Recognising safe PPE use as a complex multifaceted behaviour, we used the COM-B model to deconstruct potential challenges that could affect behaviours related to PPE use, and to design PPE helper interventions to address those challenges (see **Table I**). These crystallised to three key objectives for PPE Helpers: listen to staff members' concerns about PPE, signpost information, and promote best practice in clinical settings.

### **Table I here**

A request from the Trust Executive Team was circulated through management channels, and appropriate healthcare staff were redeployed as PPE Helpers. A ten-day pilot helped develop the scope, training and content of the role. Helpers received training about mechanisms of transmission of COVID-19, appropriate levels of PPE for different circumstances, and safe donning and doffing procedures. PPE Helpers were all clinicians (including physiotherapists, nuclear medicine technologists, nurses, scientists, and doctors), so could draw on clinical experience and transferable skills such as listening, coaching, reflection and problem-solving. Following a 'practice' ward visit with an IPC nurse, PPE Helpers were allocated to wards. Across three large hospitals within the NHS Trust, groups of helpers were supported by an identified member of the IPC team. After the initial pilot, the programme was expanded to 20 helpers across the Trust.

Informed by a daily review of all wards with COVID-19 patients, PPE Helpers were placed on wards judged by the IPC team to be in most need of support, enabling rapid adjustments to the allocation of helpers to wards as required, for example when patients requiring Aerosol Generating Procedures (AGPs) were admitted. Over a 6-week period, PPE helpers visited their designated wards each weekday, keeping records of the duration and content of visits.

1 We used a “Plan-Do-Study-Act (PDSA) cycle” [12] to develop and adapt the programme  
2 iteratively. Daily team meetings were held to share reflections and feedback from ward visits,  
3 and to discuss changes and direction of the programme e.g., an increased focus on BAME  
4 staff.  
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8 *Evaluation of the programme – survey of all staff on PPE perceptions at the conclusion of*  
9 *the programme*

10 A staff survey was developed to explore the impact of the PPE Helper programme  
11 (**Supplementary Material 1**). The content was influenced by the Theoretical Domains  
12 Framework [13] and the COM-B Model. Questions related to the staff member’s experience  
13 of using PPE and their feedback about the PPE Helpers. Positively and negatively worded  
14 questions (to prevent automatic responses) were framed using Likert scales. Paper copies of  
15 the survey were delivered to wards which had been visited by a Helper and collated each  
16 day by the ward manager. Over a ten-day period, a broad range of staff in different roles  
17 were encouraged to complete the survey. Additionally, the link to an electronic version of the  
18 survey was advertised via the daily ‘all staff email’. Participation was voluntary. Data were  
19 entered onto SPSS for Mac, version 25.0 (SSPS Inc., 221 Chicago, IL, USA) by an  
20 administrator who was not involved with the programme (CS). The work was registered  
21 locally as a service evaluation (#533).  
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33 *Analysis methods*

34 Using SPSS, staff questionnaires were analysed descriptively. Responses to numerical and  
35 closed questions were presented as frequencies and percentages. Bivariate analyses of  
36 contact with PPE Helpers, participant characteristics, and responses to questionnaire items  
37 were performed using non-parametric tests. Statistical significance was established at  
38  $p < 0.05$ . Because of small numbers in some categories, we grouped Allied Health  
39 Professionals (AHPs) with doctors, as they are autonomous professionals who usually ‘visit’  
40 wards to see patients rather than working on a given ward for an entire shift. Non-clinical  
41 support staff included cleaners, porters, and catering staff. Nursing and medical students  
42 were included in Nurse and Medical/AHP categories. Ethnic groups were re-categorised for  
43 the analysis as White or BAME (including Asian or Asian British; Black, African, Caribbean  
44 or Black British; Mixed or multiple ethnic group).  
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55 **Free-text comments were extracted into a word document, read in detail by two researchers**  
56 **independently (MW and ECS) and then coded according to content. Coded data from all**  
57 **responses were then compared and contrasted. Categories and emergent themes were**  
58 **reached by consensus between the two researchers.**  
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## Results

PPE Helpers conducted 268 visits to 30 wards across the hospital group between 20 April to 15 May 2020 and engaged with hundreds of staff using PPE during the COVID-19 surge. Overall, 261 staff questionnaires were available for analysis. Of these, 177/261 (68%) respondents reported having had contact with a PPE helper. **Supplementary Table II** shows the demographics of respondents by profession, job type and ethnicity.

### Survey findings

Staff exposed to a PPE helper were significantly more likely to respond positively to the following statements, compared with those not exposed: 'PPE is easily visible on the ward'; 'PPE is immediately available for me where and when I need it'; 'This ward has adequate facilities for donning and doffing'; 'I find it easy to use PPE appropriately'; 'I have had enough PPE training'; 'We remind each other to use PPE appropriately on this ward'. Furthermore, staff who *did not* have contact with a PPE helper were significantly more likely to agree with the following statements: 'I feel anxious that the PPE provided is not enough'; 'Other staff don't seem to use PPE appropriately' (**Figure 1 Supplementary file**).

There were no significant differences in the responses of staff who had contact with a PPE helper compared with staff who did not, in relation to the following statements: 'I understand when different levels of PPE are needed'; 'It is clear to me why different levels of PPE are used'; 'I think the current Trust PPE guidance is enough'; 'I always follow Trust PPE guidance'; 'High workload gets in the way'; 'It does not matter if I do not use PPE appropriately'; 'It will be bad for me if I do not use PPE appropriately'; 'It will be bad for other staff on the ward if I do not use PPE appropriately'; 'It will be bad for the patient if I do not use PPE appropriately' (see **Table III**).

### Table III here

BAME staff were significantly more anxious than white staff in relation to PPE being adequate: 42% of white staff disagreed/strongly disagreed with the statement 'I feel anxious that the PPE provided is not enough' compared with only 28% of BAME staff ( $p=0.004$ ). Additionally, redeployed staff were significantly more likely to agree/strongly agree with the statement 'PPE helpers have helped me to wear PPE appropriately' (77% redeployed vs 50% staff on usual ward;  $p=0.04$ ).

Across all statements, non-clinical staff tended to be more positive about PPE helpers than nurses and doctors/AHPs (see **Table IV**). Non-clinical staff were significantly more likely to



1 agree/strongly agree with the following statements: 'PPE Helpers have been there to answer  
2 my questions about PPE'; 'PPE Helpers have helped me to wear PPE appropriately';  
3 'Overall PPE Helpers have made a difference in how I use PPE'; 'Overall PPE Helpers have  
4 made me feel less anxious'.  
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#### 8 **Table IV here** 9

#### 10 Free-text findings 11

##### 12 *PPE supply and guidance* 13

14 Although a small number of staff made positive comments about the level of PPE and  
15 training they had received, most of the free-text comments conveyed concern about at least  
16 one of the following aspects of PPE: - adequacy and/or equity of supply across clinical areas  
17 and across professions; inconsistent advice and guidance; or level of training provided. The  
18 most commonly expressed concerns were about the supply of PPE, often linked with  
19 negative comments about the guidance issued. Staff expressed frustration, confusion and  
20 anxiety about the frequent changes, and a lack of trust in the PHE guidance, which  
21 sometimes translated into a lack of faith in leaders and managers in relation to PPE  
22 provision. Several comments by staff reflected concerns that lack of stock, rather than  
23 scientific evidence, was behind the guidance.  
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32 Others expressed unease because they perceived that the supply of PPE was not consistent  
33 across clinical areas and across professions. Some openly said that this had affected morale  
34 and sickness levels. One member of staff commented: '*There was also different wards,  
35 some wearing more PPE than my staff who were following the PHE and local guidance,  
36 which caused a lot of stress and anxiety. It made it difficult for managers to lead the team  
37 and have the trust from staff with guidance changing so frequently.*' (Nurse) A junior doctor  
38 expressed feelings of guilt at wearing PPE and said that there was a real need for '*More  
39 PPE on the non critical care wards*'.  
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48 Several members of staff stated that supplies had been inadequate during early stages of  
49 the pandemic. A small number described problems related more to the environment than the  
50 supply of PPE or the guidance around it e.g., inadequate donning and doffing areas.  
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##### 54 *Training and Communication* 55

56 Many of the staff comments suggested a need for more training on PPE and infection  
57 control. Some felt that information and training materials were provided too late, or they had  
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1 not been made aware of sources of information at the appropriate time. A few intimated that  
2 they had been infected with COVID-19 because of a lack of education.  
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5 Suggestions for further training included ward-based teaching, incorporating PPE/IPC  
6 training at induction / statutory mandatory learning and in redeployment study days, and  
7 regular training updates when new guidance is issued. One person wanted more information  
8 and advice about maintaining wellbeing while wearing PPE, including wearing wipeable  
9 shoes and maintaining skin integrity and hydration.  
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15 Many of the suggestions made about training and communication had been incorporated  
16 into the PPE helper programme, but not all staff had met a PPE helper.  
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#### 18 19 20 *Feedback on PPE helpers*

21 Several positive comments were made about the PPE helpers, including:

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23 *'PPE helpers are very good to point out good and bad practice of PPE on the ward - how to*  
24 *don and doff appropriately'* (Nurse)

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28 *'Nothing beats having a person observing and reminding staff'* (Non-clinical support staff)

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32 *'The team were lovely and did pick up on inappropriate use of PPE by visitors to the ward'*  
33 (Nurse)

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37 However, many staff suggested that the programme would have been more beneficial at an  
38 earlier stage. A few said they had found the presence of the Helpers unhelpful, for example:

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40 *'It feels intimidating when PPE helpers are watching over you especially when your busy.*  
41 *Feels uncomfortable. Maybe less frequent visits or come at less busy times of the shift.'*

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43 (Nurse)

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47 The manner, approach and consistency of PPE Helpers was seen as important. As one  
48 person said: *'When a PPE helper does the job well not just in terms of the explanation and*  
49 *reminders they give but also in terms of the way they relate to different people and gain their*  
50 *confidence, then no improvement is necessary (some helpers need better people skills)'*  
51 (Non-clinical support staff).

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57 Suggestions for improving the programme included more frequent visits, particularly at the  
58 start of the morning shift, when the first donning and doffing was taking place, and during the  
59 night shift. Staff felt that the PPE helpers needed to be more visible and identifiable (e.g.,  
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through a uniform) and they also wanted to be able to contact them via email or phone. Some commented on the need for PPE helpers in departments such as pharmacy, and for staff groups who were 'visiting' wards e.g., phlebotomists, so that they were better prepared for PPE on the wards. It was also suggested that link nurses on wards could be PPE Helpers.

Overall, the free-text comments conveyed a strong desire for better levels of PPE, more consistent guidance, support and education throughout the pandemic. It was apparent that staff felt that both PPE supplies and help came considerably later than needed.

### **Discussion**

At the peak of the COVID-19 pandemic in London, we rapidly developed and deployed a novel, theory-based IPC intervention focused on supporting staff knowledge, attitudes, emotions and behaviours about the correct use of PPE. Our experience shows that it was possible to reach a large number of 'at risk' clinical areas in a relatively short time. Survey results suggest that the PPE Helper programme had a positive impact on knowledge, attitudes, concerns and behaviours among staff.

Staff stating contact with a PPE Helper reported more positive knowledge and attitudes towards PPE, including confidence in the use of PPE, satisfaction with the availability and visibility of PPE in clinical areas, and less anxiety around PPE and the burden of COVID-19 related work on staff. The benefits of the PPE Helpers were greater among redeployed staff and non-clinical workers such as porters, catering staff and cleaners. Although the number of non-clinical respondents was relatively small in comparison to nurses, doctors and AHPs, this is an important finding. It could reflect gaps in adequate PPE training or access to PPE educational resources for these staffing groups, including the effectiveness of current information channels like the intranet. Redeployed staff had been separated from usual work support networks and were often working in unfamiliar environments. As such these staff benefited particularly from the "hands on" support and advice provided through the PPE Helper programme. Consideration should be given as to how hospitals better support these occupational groups when developing PPE interventions.[14]

Perhaps unsurprisingly, concerns about PPE and high workload were greater among BAME staff. This may reflect concerns about the emerging evidence regarding worse outcomes for COVID-19 in BAME communities [15] and/or known and pre-existing inequalities and inequities in BAME staff.[16] The results of the survey do not suggest that BAME staff benefited from the PPE Helper programme any more or less than white staff. Further

1 attention needs to be given to engaging with BAME staff's concerns, enabling them to speak  
2 up, supporting training and development and specifically addressing any religious clothing-  
3 related issues that may have an impact on their ability to wear PPE safely.

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5 The results must be framed within certain limitations. The cross-sectional design prevents us  
6 from directly attributing the results to the effect of PPE Helpers. We did not have a baseline  
7 comparison, nor do we know whether the apparent beneficial effects of the programme have  
8 been maintained beyond the project. Our evaluation focused on staff opinions, perceptions  
9 and emotions using a modified survey tool which, although underpinned by well-established  
10 evidence, remains unvalidated. In addition, the views of the staff who completed the survey  
11 may not be representative. However, the implementation of the programme and the  
12 evaluation of the perceptions of over 250 staff was extremely timely and has a number of  
13 implications.  
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21 The excess capacity afforded by redeployed clinical staff and volunteers from academic and  
22 support areas enabled the rapid implementation of the PPE Helper programme.

23 Organisations interested in adopting or scaling up a similar model must consider its  
24 feasibility and sustainability in their local setting and workforce. Commissioners exploring an  
25 economic evaluation of the programme should carefully account for such resourcing. PPE  
26 Helper roles could be embedded in existing posts such as link nurses or formalised in patient  
27 safety or IPC practitioners. Our experience suggests that using PPE Helpers who were  
28 external to the wards had some benefits, in that staff appeared to respect their knowledge  
29 and contribution, and felt safe talking to them about concerns. Whichever staff groups are  
30 used, it is important that skilled communication, training and support are at the heart of the  
31 intervention.  
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41 The implementation of assistant or 'buddy' roles to promote and support optimal IPC  
42 practices, including PPE donning and doffing, has been seen in comparable pandemic  
43 surges and high consequence infectious diseases in various settings.[17-19] Although the  
44 IPC buddy system is generally advocated as a useful failsafe, there is a lack of evidence  
45 about its individual contribution to better infection prevention performance. Our intervention  
46 not only supported the correct use of PPE, but also addressed staff concerns and emotional  
47 burnout, both areas increasingly singled out for their impact on healthcare workers.[20] In  
48 designing the PPE Helper programme, we recognised that staff decisions to use the most  
49 appropriate PPE for the given clinical situation were unlikely to be shaped by existing  
50 evidence alone.[21] Indeed, some of the staff who engaged with the programme were  
51 sceptical about the evidence and viewed it with suspicion. This was particularly the case in  
52 the context of rapidly changing and sometimes contradictory guidance, issued in parallel to  
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1 reports of national shortages in PPE supply. The uncertainty about recommended PPE  
2 behaviours could be further compounded by the stressful working conditions [22] and  
3 societal alarm [23, 24] created by the COVID-19 pandemic.

4 Communal perceptions about the quality, availability and suitability of PPE could also have  
5 influenced the knowledge and opinions of staff. As reflected in other scenarios, the  
6 mandates of practice guidelines are often reformulated onto 'mindlines' (internalised and  
7 collectively reinforced tacit guidelines),[25] which can lead to dissonant or outlying  
8 behaviours.[26] More concerningly in relation to COVID-19, these behaviours can fuel further  
9 scepticism about institutional recommendations on PPE, fostering suboptimal and risky  
10 practices and incurring wastage. The PPE Helpers were able to provide reassurance,  
11 explain the institutional decision-making process and the evidence used for it, and dispel  
12 myths and disinformation. The Helpers also served as a conduit for information between  
13 staff on the ground, the IPC and more senior management, activating a rapid feedback  
14 mechanism and providing a cohesive narrative about PPE changes.[27]

## 24 **Conclusions**

25 We have shown how an intervention to improve PPE practice in hospitals can be developed  
26 and implemented rapidly during a pandemic in response to concerns over PPE practice and  
27 staff trust in guidance. This type of "hands on" intervention appears to most benefit hard-to-  
28 reach staffing groups, where adequate PPE knowledge and training may be lacking. For a  
29 PPE Helper programme to be most effective, and in planning for a second wave of COVID-  
30 19 or other infectious disease outbreak, we recommend that establishing such a programme  
31 is prioritised early in the response. In addition, a more sustainable programme of PPE and  
32 hand hygiene support is recommended between outbreaks of infectious disease.  
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## References

1. Johns Hopkins University & Medicine. Coronavirus resource center. <https://coronavirus.jhu.edu/>. Accessed 24/08/2020.
2. UK government. Coronavirus (COVID-19) in the UK. Coronavirus (COVID-19) cases in the UK. <https://coronavirus.data.gov.uk/> Accessed 18/09/2020/
3. Al-Ani AH, Prentice RE, Rentsch CA, Johnson D, Ardalan Z, Heerasing N, et al. Review article: prevention, diagnosis and management of COVID-19 in the IBD patient. *Aliment Pharmacol Ther*;52:54-72.
4. BBC News. Coronavirus: Has the NHS got enough PPE? <https://www.bbc.co.uk/news/health-52254745>. Accessed 24/08/2020.
5. Public Health England. Beyond the data: Understanding the impact of COVID-19 on BAME groups. 2020. [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/892376/COVID\\_stakeholder\\_engagement\\_synthesis\\_beyond\\_the\\_data.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/892376/COVID_stakeholder_engagement_synthesis_beyond_the_data.pdf). Date accessed 24/08/2020
6. The Conversation. Families of healthcare staff who die from coronavirus could claim for more than £60,000. <https://theconversation.com/families-of-healthcare-staff-who-die-from-coronavirus-could-claim-for-more-than-60-000-137573>. Date accessed 24/08/2020
7. Public Health England. Guidance on the use of personal protective equipment (PPE). 2020. <https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/03/PPE-Letter-FINAL-20-March-2020-updated-on-22-March-2020.pdf>. Date accessed 24/08/2020
8. Verbeek JH, Rajamaki B, Ijaz S, Sauni R, Toomey E, Blackwood B, et al. Personal protective equipment for preventing highly infectious diseases due to exposure to contaminated body fluids in healthcare staff. *Cochrane Database Syst Rev* 2016;4:CD011621.
9. Evans S, Agnew E, Vynnycky E, Robotham JV. The impact of testing and infection prevention and control strategies on within-hospital transmission dynamics of COVID-19 in

English hospitals. *medRxiv* 2020.05.12.20095562; doi:

<https://doi.org/10.1101/2020.05.12.20095562>

10. Suen LKP, Guo YP, Tong DWK, Leung PHM, Lung D, Ng MSP, et al. Self-contamination during doffing of personal protective equipment by healthcare workers to prevent Ebola transmission. *Antimicrob Resist Infect Control* 2018;7:157

11. Michie S, Van Stralen MM, West R. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Impl Sci* 2011;6:42. doi: 10.1186/1748-5908-6-42.

12. Taylor MJ, McNicholas C, Nicolay C, Darzi A, Bell D, Reed JE. Systematic review of the application of the plan–do–study–act method to improve quality in healthcare. *BMJ Qual Saf* 2014;23:290-298.

13. Cane J, O'Connor D, Michie S. Validation of the theoretical domains framework for use in behaviour change and implementation research. *Impl Sci* 2012;7:37. <https://doi.org/10.1186/1748-5908-7-37>.

14. Felix A, Gama KM, Padoveze MC, Villar Felix EP. Impact of a Practical Training Program for Hospital Cleaning Staff on Prevention of Hospital Acquired Infection. *Am J Infect Control* 2014;42:S90

15. NHS Confederation. The NHS after covid-19: the views of provider trust chief executives. 2020. [https://www.nhsconfed.org/-/media/Confederation/Files/Publications/Documents/NHS-after-COVID-19---views-of\\_CEOs\\_FNL\\_.pdf?dl=1](https://www.nhsconfed.org/-/media/Confederation/Files/Publications/Documents/NHS-after-COVID-19---views-of_CEOs_FNL_.pdf?dl=1). Accessed on 24/08/2020.

16. Workforce Race Equality Standard Implementation Team. NHS workforce race equality standard- 2019 data analysis report for NHS trusts. 2019) <https://www.england.nhs.uk/wp-content/uploads/2020/01/wres-2019-data-report.pdf>. Accessed on 24/08/2020.

17. Poller B, Tunbridge A, Hall S, Beadsworth M, Jacobs M, Peters E, et al. A unified personal protective equipment ensemble for clinical response to possible high consequence infectious diseases: A consensus document on behalf of the HCID programme. *J Infect* 2018;77(6):496-502. doi:10.1016/j.jinf.2018.08.016



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18. Andonian J, Kazi S, Therkorn J, **Andonian J, Kazi S, Therkorn J**, et al. Effect of an Intervention Package and Teamwork Training to Prevent Healthcare Personnel Self-contamination During Personal Protective Equipment Doffing. *Clin Infect Dis* 2019;69(Suppl 3):S248-S255. doi:10.1093/cid/ciz618

19 Reidy P, Fletcher T, Shieber C, **Shallcross J, Towler H, Ping M**, et al. Personal protective equipment solution for UK military medical personnel working in an Ebola virus disease treatment unit in Sierra Leone. *J Hosp Infect* 2017;96:42-48

20 Rossi R, Socci V, Pacitti F, **Di Lorenzo G, Di Marco A, Siracusano A**, et al. Mental Health Outcomes Among Frontline and Second-Line Health Care Workers During the Coronavirus Disease 2019 (COVID-19) Pandemic in Italy. *JAMA Netw Open* 2020;3:e2010185

21. Houghton C, Meskell P, Delaney H, **Smalle M, Glenton C, Booth A**, et al. Barriers and facilitators to healthcare workers' adherence with infection prevention and control (IPC) guidelines for respiratory infectious diseases: a rapid qualitative evidence synthesis. *Cochrane Database Syst Rev* 2020;4(4):CD013582. doi:10.1002/14651858.CD013582

22. Lasater KB, Aiken LH, Sloane DM, **French R, Martin B, Reneau K**, et al. Chronic hospital nurse understaffing meets COVID-19: an observational study. *BMJ Qual Saf* 2020;bmjqs-2020-011512. doi:10.1136/bmjqs-2020-011512

23. Salari N, Hosseini-Far A, Jalali R, **Vaisi-Raygani A, Rasoulpoor S, Mohammadi M**, et al. Prevalence of stress, anxiety, depression among the general population during the COVID-19 pandemic: a systematic review and meta-analysis. *Global Health* 2020;16:57

24. Shi L, Lu ZA, Que JY, **Huang KL, Liu Lin, Ran MS**, et al. Prevalence of and Risk Factors Associated With Mental Health Symptoms Among the General Population in China During the Coronavirus Disease 2019 Pandemic. *JAMA Netw Open* 2020;3:e2014053.)

25. Gabbay J, le May A. Evidence based guidelines or collectively constructed "mindlines?" Ethnographic study of knowledge management in primary care. *BMJ* 2004;329:1013.

26. Chandler CI, Jones C, Boniface G, **Juma K, Reyburn H, Whitty CJM**. Guidelines and mindlines: why do clinical staff over-diagnose malaria in Tanzania? A qualitative study. *Malar J* 2008;7:53. doi:10.1186/1475-2875-7-53

27. Shelton RC, Lee M, Brotzman LE, Wolfenden L, Nathan N, Wainberg ML. What Is  
Dissemination and Implementation Science?: An Introduction and Opportunities to Advance  
Behavioral Medicine and Public Health Globally. *Int J Behav Med* 2020;27(1):3-20. doi:  
10.1007/s12529-020-09848-x.

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**Table I. Challenges and key features of the PPE Helper Programme using the COM-B Model**

	<b>Potential challenges</b>	<b>Key features of the PPE Helper programme</b>
Capability – <i>to ensure the person has the necessary <b>knowledge and skills</b> to perform the behaviour</i>	<ul style="list-style-type: none"> <li>• Rapidly changing national guidance</li> <li>• Lack of clarity or confusion on the most up-to-date knowledge and information on PPE use</li> <li>• Lack of knowledge or confusion on the transmission mechanism of the SARS-CoV-2 virus</li> <li>• Lack of knowledge or confusion on mask FIT testing processes</li> </ul>	<ul style="list-style-type: none"> <li>• Ensured that changes to national PPE guidance were related to staff in a timely manner</li> <li>• Provided more personalised PPE knowledge and practical training depending on the staff member’s understanding, patient cohort and the care being provided</li> <li>• Supported staff with and without previous experience of using PPE to learn techniques so that they could practice safe donning and doffing</li> <li>• Signposted staff to the Intranet for further information on safe PPE use</li> <li>• Communicated the risks of over and underuse of PPE, the importance of good technique in donning and doffing and the importance of hand hygiene</li> </ul>
Opportunity – <i>to ensure there are no <b>environmental constraints</b> that make it impossible to perform the behaviour</i>	<ul style="list-style-type: none"> <li>• Physical or psychological harm and pain caused by PPE</li> <li>• Lack of immediate access to appropriate PPE</li> <li>• Lack of opportunity to learn and practice safe donning and doffing technique</li> <li>• Lack of appropriate space to store and dispose of PPE</li> <li>• Lack of appropriate space to doff PPE safely</li> <li>• Physical characteristics, e.g. glasses, long hair, body shape, religious clothing items</li> <li>• Lack of time, intense workload pressures, and life or death decisions</li> <li>• Normalisation of sub-optimal PPE use (social norms)</li> <li>• Lack of or unclear social cues and prompts for safe use of PPE</li> <li>• Lack of timely access to Intranet</li> </ul>	<ul style="list-style-type: none"> <li>• Assessing concerns and obstacles to using PPE safely</li> <li>• Signposting staff to mask FIT testing services</li> <li>• Reporting on local PPE shortages</li> <li>• Providing advice on safer ways to store and dispose of PPE</li> <li>• Providing advice on better ways to use space to don and doff safely</li> </ul>
Motivation – <i>to ensure the person has formed a <b>strong</b></i>	<ul style="list-style-type: none"> <li>• Unfounded or incorrect beliefs or perceptions on PPE use e.g. severe PPE shortages (scarcity), belief that overuse increases personal safety</li> </ul>	<ul style="list-style-type: none"> <li>• Active listening of concerns to build trust and to reassure staff</li> <li>• Coaching conversations to support problem solving</li> <li>• Myth-busting</li> </ul>

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<p><b><i>positive intention to perform the behaviour</i></b></p>	<ul style="list-style-type: none"><li>• Heightened emotion, distress, anxiety and fear</li><li>• Forgetfulness due to an unprecedented working environment (cognitive load)</li><li>• Recalling that previous sub-optimal use did not appear to harm the individual</li><li>• Impulsive doffing behaviour e.g. a strong and emotive desire to get PPE off when completing care of COVID-19 patients</li><li>• Recollection of previous physical or psychological harm and pain caused by PPE</li><li>• Habitual PPE use</li></ul>	<ul style="list-style-type: none"><li>• Reinforcing good practice through face-to-face feedback wherever staff were using PPE safely and appropriately</li><li>• Signposting staff to other Trust support; i.e. webpages, IPC team</li><li>• Following up on specific questions from staff</li></ul>
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**Table II (Supplementary material). Demographics of respondents**

		Contact with PPE helper?				Did not complete this question
		No		Yes		
<b>Profession</b>	Nurse	48	57.8%	118	70.2%	
	Medical & AHP	20	24.1%	24	14.3%	
	Non-clinical support staff	15	18.1%	26	15.5%	
	Total	83	100.0%	168	100.0%	10
<b>Job type</b>	Usual ward	51	59.3%	110	65.9%	
	Redeployed	20	23.3%	40	24.0%	
	Other*	15	17.4%	17	10.2%	
	Total	86	100.0%	167	100.0%	8
<b>Ethnicity</b>	White	57	67.1%	70	44.9%	
	BAME	28	32.9%	86	55.1%	
	Total	85	100.0%	156	100.0%	20

\*included staff who did not specify whether they had been redeployed but who worked in other roles e.g. corporate, non-ward based teams.

**Table III. Opinions about PPE, by contact with a PPE helper**

Questionnaire Statement	Response	Contact with PPE helper		P value
		Yes n (%)	No n (%)	
PPE is easily visible on the ward	Agree/Strongly Agree Neither agree nor disagree Disagree/Strongly disagree Total	155 (89.6) 15 (8.7) 3 (1.7) 173 (100)	56 (65.1) 13 (15.1) 17 (19.8) 86 (100)	<0.001*
I have had enough PPE training	Agree/Strongly Agree Neither agree nor disagree Disagree/Strongly disagree Total	125 (71.8) 22 (12.6) 27 (15.5) 174 (100)	42 (48.8) 16 (18.6) 28 (32.6) 86 (100)	<0.001*
PPE is immediately available for me where and when I need it	Agree/Strongly agree Neither agree nor disagree Disagree/Strongly disagree Total	118 (68.6) 15 (8.7) 39 (22.7) 172 (100)	37 (43.5) 12 (14.1) 36 (42.4) 85 (100)	<0.001*
This ward has adequate facilities for safely donning/doffing	Agree/Strongly agree Neither agree nor disagree Disagree/Strongly disagree Total	128 (74.4) 21 (12.2) 23 (13.4) 172 (100)	42 (48.8) 19 (22.1) 25 (29.1) 86 (100)	<0.001*
I find it easy to use PPE appropriately	Agree/Strongly agree Neither agree nor disagree Disagree/Strongly disagree Total	141 (82.5) 21 (12.3) 9 (5.3) 171 (100)	48 (56.5) 19 (22.4) 18 (21.2) 85 (100)	<0.001*
I understand when different levels of PPE are needed	Agree/Strongly agree Neither agree nor disagree Disagree/Strongly disagree Total	142 (82.1) 19 (11) 12 (6.9) 173 (100)	69 (80.2) 5 (5.8) 12 (14) 86 (100)	0.09
It is clear to me why different levels of PPE are used	Agree/Strongly agree Neither agree nor disagree Disagree/Strongly disagree Total	141 (81) 13 (7.5) 20 (11.5) 174 (100)	60 (69.8) 10 (11.6) 16 (18.6) 86 (100)	0.12
I think the current Trust PPE guidance is enough	Agree/Strongly agree Neither agree nor disagree Disagree/Strongly disagree Total	131 (75.7) 42 (24.3) 0 (0.0) 173 (100)	70 (81.4) 16 (18.6) 0 (0.0) 86 (100)	0.30
I always follow Trust PPE guidance	Agree/Strongly agree Neither agree nor disagree Disagree/Strongly disagree Total	145 (83.8) 17 (9.8) 11 (6.4) 173 (100)	72 (83.7) 7 (8.1) 7 (8.1) 86 (100)	0.80
High workload gets in the way	Agree/Strongly agree Neither agree nor disagree Disagree/Strongly disagree Total	49 (28.5) 26 (15.1) 97 (56.4) 172 (100)	25 (29.4) 13 (15.3) 47 (55.3) 85 (100)	0.99
I feel anxious that the PPE provided is not enough	Agree/Strongly agree Neither agree nor disagree Disagree/Strongly disagree Total	72 (41.9) 32 (18.6) 68 (39.5) 172 (100)	57 (66.3) 7 (8.1) 22 (25.6) 86 (100)	<0.001*

1 2 3 4	It does not matter if I do not use PPE appropriately	Agree/Strongly agree Neither agree nor disagree Disagree/Strongly disagree Total	5 (2.9) 1 (0.6) 165 (96.5) 171 (100)	2 (2.3) 0 (0) 84 (97.7) 86 (100)	0.75
5 6 7 8 9	Other staff don't seem to use PPE appropriately	Agree/Strongly agree Neither agree nor disagree Disagree/Strongly disagree Total	38 (22.2) 51 (29.8) 82 (48) 171 (100)	32 (37.2) 21 (24.4) 33 (38.4) 86 (100)	0.04*
10 11 12 13	We remind each other to use PPE appropriately on this ward	Agree/Strongly agree Neither agree nor disagree Disagree/Strongly disagree Total	148 (85.5) 18 (10.4) 7 (4) 173 (100)	63 (73.3) 13 (15.1) 10 (11.6) 86 (100)	0.03*
14 15 16 17 18	It will be bad for me if I do not use PPE appropriately	Agree/Strongly agree Neither agree nor disagree Disagree/Strongly disagree Total	165 (95.9) 6 (3.5) 1 (0.6) 172 (100)	84 (97.7) 0 (0.0) 2 (2.3) 86 (100)	0.10
19 20 21 22 23	It will be bad for other staff on the ward if I do not use PPE appropriately	Agree/Strongly agree Neither agree nor disagree Disagree/Strongly disagree Total	168 (97.1) 3 (1.7) 2 (1.2) 173 (100)	84 (97.7) 0 (0.0) 2 (2.3) 86 (100)	0.37
24 25 26 27 28	It will be bad for the patient if I do not use PPE appropriately	Agree/Strongly agree Neither agree nor disagree Disagree/Strongly disagree Total	162 (94.2) 6 (3.5) 4 (2.3) 172 (100)	80 (94.1) 2 (2.4) 3 (3.5) 85 (100)	0.76

29 \*chi-squared statistic significant at 0.05 level

**Table IV. Responses to questions on impact of PPE Helpers, by professional group**

Questionnaire Statement	Response	Nurses	Doctors / AHPs	Non-clinical staff	P-value
		n (%)	n (%)	n (%)	
PPE Helpers have supported me to better understand why different levels of PPE are needed for different situations	Agree/Strongly Agree	57 (52.3%)	10 (43.5%)	17 (68.0%)	0.17
	Neither agree nor disagree	28 (25.7%)	10 (43.5%)	6 (24.0%)	
	Disagree/Strongly disagree	24 (22.0%)	3 (13.0%)	2 (8.0%)	
	Total	109 (100%)	23 (100%)	25 (100%)	
PPE Helpers have supported me to understand how to use PPE appropriately	Agree/Strongly agree	54 (50%)	13 (56.5%)	19 (76.0%)	0.09
	Neither agree nor disagree	29 (26.9%)	8 (34.8%)	4 (16.0%)	
	Disagree/Strongly disagree	25 (23.1%)	2 (8.7%)	2 (8.0%)	
	Total	108 (100%)	23 (100%)	25 (100%)	
PPE Helpers have not provided helpful information about PPE	Agree/Strongly agree	21 (19.4%)	5 (21.7%)	6 (24%)	0.41
	Neither agree nor disagree	31 (28.7%)	8 (34.8%)	3 (12%)	
	Disagree/Strongly disagree	56 (51.9%)	10 (43.5%)	16 (64%)	
	Total	108 (100%)	23 (100%)	25 (100.0%)	
PPE Helpers have been there to answer questions about PPE	Agree/Strongly agree	57 (53.3%)	10 (43.5%)	20 (80.0%)	0.02*
	Neither agree nor disagree	29 (27.1%)	11 (47.8%)	4 (16.0%)	
	Disagree/Strongly disagree	21 (19.6%)	2 (8.7%)	1 (4.0%)	
	Total	107 (100%)	23 (100%)	25 (100%)	
PPE Helpers have helped me to wear PPE appropriately	Agree/Strongly agree	55 (51.4%)	15 (65.2%)	20 (80.0%)	0.02*
	Neither agree nor disagree	33 (30.8%)	8 (34.8%)	2 (8.0%)	
	Disagree/Strongly disagree	19 (17.8%)	0 (0.0%)	3 (12%)	
	Total	107 (100%)	23 (100%)	25 (100%)	
PPE Helpers have not motivated me to use PPE more appropriately	Agree/Strongly agree	12 (11.1%)	4 (17.4%)	5 (20.0%)	0.56
	Neither agree nor disagree	40 (37.0%)	9 (39.1%)	6 (24.0%)	
	Disagree/Strongly disagree	56 (51.9%)	10 (43.5%)	14 (56.0%)	
	Total	108 (100%)	23 (100%)	25 (100%)	
Overall the PPE Helpers have made a difference in how I use PPE	Agree/Strongly agree	48 (45.3%)	7 (30.4%)	18 (72.0%)	0.03*
	Neither agree nor disagree	38 (35.8%)	12 (52.2%)	3 (12.0%)	
	Disagree/Strongly disagree	20 (18.9%)	4 (17.4%)	4 (16.0%)	
	Total	106 (100%)	23 (100%)	25 (100%)	
Overall PPE Helpers have made a difference to how other staff on the ward use PPE	Agree/Strongly agree	48 (45.3%)	10 (43.5%)	16 (66.7%)	0.34
	Neither agree nor disagree	42 (39.6%)	10 (43.5%)	7 (29.2%)	
	Disagree/Strongly disagree	16 (15.1%)	3 (13.0%)	1 (4.2%)	
	Total	106 (100%)	23 (100%)	24 (100%)	
Overall the PPE Helpers have made me feel less anxious	Agree/Strongly agree	38 (35.8%)	9 (39.1%)	18 (72.0%)	0.02*
	Neither agree nor disagree	45 (42.5%)	11 (47.8%)	6 (24.0%)	
	Disagree/Strongly disagree	23 (21.7%)	3 (13.0%)	1 (4.0%)	
	Total	106 (100%)	23 (100%)	25 (100%)	

\*chi-squared statistic significant at 0.05 level

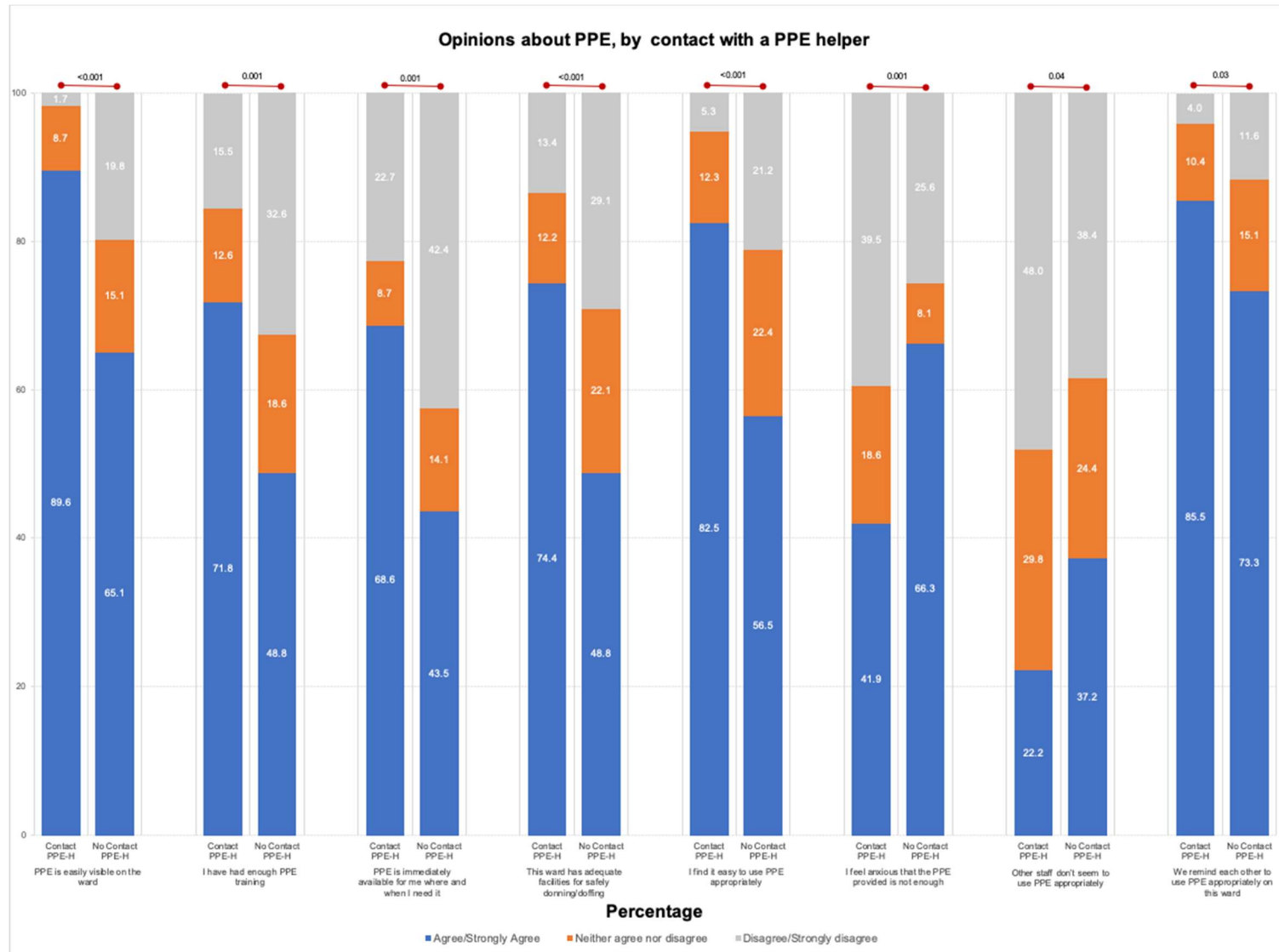


**Figure 1 (Supplementary material).**

**Caption: Statistically significant opinions about PPE, by contact with a PPE Helper.**

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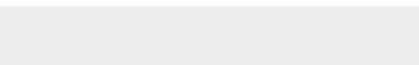
Figure 1. Opinions about PPE, by contact with a PPE Helper, statistically significant

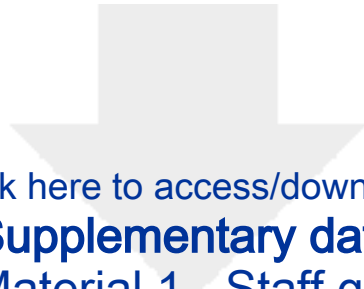






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**Supplementary data**  
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**Supplementary data**

Supplementary Material 1 - Staff questionnaire.docx

