

Correspondence

Can gendered personal protective equipment design account for high infection rates in female healthcare workers following intubation?

Female sex was identified in the study by El-Boghdadly et al. as an independent factor for proven or suspected COVID-19 infection of healthcare workers following intubation [1]. As one of the significant findings outlined in the paper, it was surprising to us that this was not given more prominence in the discussion or the infographic associated with the article.

Whereas it is clear that this association does not necessarily amount to causation, a hazard ratio of 1.36 ($p = 0.04$) is substantial enough to compel further exploration. It is unlikely that the finding of increased reporting in women can be attributed to a female predisposition to SARS-CoV-2 infection as this has not been demonstrated elsewhere in the literature. In sex disaggregated data of over 1.3 million cases reported world-wide, there are no marked gender differences in rates of COVID-19 infection in the general population in 18 countries, with an overall rate of 51.2% female [2]. Why then is the post-intubation healthcare worker infection rate so notably skewed towards women?

El-Boghdadly et al. propose that 'biological differences' may be a factor in this disparity, without elaborating further. We postulate that one biologically relevant difference could be body habitus and the gendered design of personal protective equipment (PPE). Personal protective equipment has been noted in other sectors, such as mining and engineering, to be designed for the male body shape [3]. It stands to reason that this may also be the case in the health sector, and studies by the Royal College of Nursing and ergonomists are underway to investigate.

The COVID-19 outbreak has brought these issues to the attention of the UK media, where anecdotes of sex disparity in the appropriate fit of PPE have been proffered from various NHS sources [4,5]. Stories abound within healthcare about 'unisex' (for which read: inadequately sized) PPE – gowns so large that they drag on the floor and trip up the wearer, gloves that are not available in small enough sizes,

visors that are dislodged by breasts when the intubator looks down, and ill-fitting facemasks and goggles that fail to seal when applied to smaller female faces. Such PPE, whereas not being fit for purpose when worn, may also prove more difficult (and therefore more dangerous) to doff.

Women comprise over three-quarters of healthcare workers in the UK and many other countries. Failure to adequately protect a large sector of the workforce is ethically unsound, a health and safety issue, and a looming potential class action lawsuit. Urgent research is needed to ascertain the extent of the problem, and immediate action is required to ensure sex equity in PPE provision.

M. C. Turner

Great Ormond Street Hospital for Children,
London, UK

Email: maryann.turner@gmail.com

S. D. Marshall

Monash University,
Melbourne, Australia

No competing interests declared.

References

1. El-Boghdadly K, Wong DJN, Owen R, et al. Risks to healthcare workers following tracheal intubation of patients with COVID-19: a prospective international multicentre cohort study. *Anaesthesia* 2020; **75**: 1437–47.
2. UN Women. COVID-19: Emerging gender data and why it matters. 2020. <https://data.unwomen.org/resources/covid-19-emerging-gender-data-and-why-it-matters> (accessed 18/06/2020).
3. Trades Union Congress. Personal protective equipment and women: Guidance for workplace representatives on ensuring it is a safe fit. 2017. <https://www.tuc.org.uk/research-analysis/reports/personal-protective-equipment-and-women> (accessed 11/06/2020).
4. Merson A. Unions say coronavirus crisis has brought 'into sharp focus' the problem of women being expected to wear PPE designed for men. *Press and Journal* 16 April 2020. <https://www.pressandjournal.co.uk/fp/news/politics/uk-politics/2142580/unions-say-coronavirus-crisis-has-brought-into-sharp-focus-the->

Responses to previously published articles or letters may be made using the commenting feature on the journal website or submitted via Editorial Manager. Correspondence on new topics should be submitted via Editorial Manager. Please visit the journal homepage for guidance.

problem-of-women-being-expected-to-wear-ppe-designed-for-men (accessed 18/06/2020).

5. Topping A. Sexism on the COVID-19 frontline: 'PPE is made for a 6ft 3in rugby player'. *Guardian* 24 April 2020. <https://www.theguardian.com/world/2020/apr/24/sexism-on-the-covid-19->

frontline-ppe-is-made-for-a-6ft-3in-rugby-player (accessed 18/06/2020).

doi:10.1111/anae.15206

Can gendered personal protective equipment design account for high infection rates in female healthcare workers following intubation? A reply

We thank Drs Turner and Marshall [1] for their interest in our recent publication [2] and agree that the higher incidence of the primary endpoint in females found in our study warrants further investigation. This association persisted despite adjustment for role and country in a multivariable proportional hazards model. Whereas the underlying cause of this association is unclear, we had suggested potential hypotheses regarding the biological differences between men and women, differences in symptom-reporting behaviour or possibly variations due to heterogeneous sex distributions in our sample.

However, we urge caution in over-interpreting the magnitude of this effect. The point estimate of the hazard ratio for women was 1.36, and the 95%CI was 1.01–1.82. This would be consistent with a true hazard ratio that is unlikely to be clinically significant at the lower bound, to an extremely large effect at the upper bound.

Our study was primarily designed to estimate the incidence of COVID-19-related outcomes in healthcare workers involved in tracheal intubation, and the identification of risk factors was a secondary outcome. We did not perform adjustments for multiple testing in our exploratory analyses for risk factors and therefore did not feel it warranted focus in our report. However, observational studies such as ours present opportunities for hypothesis generation, and thus there is a critical need for future studies to explore this potential relationship further.

We agree with Drs Turner and Marshall that gender-insensitive personal protective equipment (PPE) may potentially explain the findings in our study. The suitability of respirator masks and other PPE items sensitive to differences in baseline characteristics including sex and ethnicity, is an area that needs urgent exploration [3]. As well as improving access and training in PPE utilisation, objective data from fit-testing to determine characteristics of respirators design that would indicate suitability to a wide

range of healthcare workers, are called for [4]. As the pandemic subsides in many regions, the time has come to prepare ourselves for the possibility of a second surge by ensuring the safety of our healthcare workforce, regardless of social, ethnic or other baseline characteristics. The hypotheses generated from our paper represent an opportunity to understand this potential inequity further [1].

D. J. N. Wong 

K. El-Boghdady 

C. Johnstone

I. Ahmad

Guy's and St Thomas' NHS Foundation Trust
London, UK

on behalf of the intubate COVID collaborators
Email: dannywong@doctors.net.uk

KE is an editor of *Anaesthesia*. No other competing interests declared.

References

1. Turner MA, Marshall SD. Can gendered personal protective equipment design account for high infection rates in female healthcare workers following intubation? *Anaesthesia* 2021; **76**: 132–2.
2. El-Boghdady K, Wong DJN, Owen R, et al. Risks to healthcare workers following tracheal intubation of patients with COVID-19: a prospective international multicentre cohort study. *Anaesthesia* 2020; **75**: 1437–47.
3. Oestestad RK, Elliott LJ, Beasley TM. The effect of gender and respirator brand on the association of respirator fit with facial dimensions. *Journal of Occupational and Environmental Hygiene* 2007; **4**: 923–30.
4. Health and Safety Executive. The selection, use and maintenance of respiratory protective equipment – A practical guide HSG53. 2013. www.hse.gov.uk/pUbns/priced/hsg53.pdf (accessed 14/06/2020).

doi:10.1111/anae.15207