

# Journal Pre-proof

Laundering single use gowns in the event of critical shortage: Experience of a UK Acute Trust

Bozena Poller, Christopher Lynch, Reg Ramsden, Karen Jessop, Cariad Evans, Karen Tweed, Caroline Drew, Christine Bates



PII: S0195-6701(20)30404-7

DOI: <https://doi.org/10.1016/j.jhin.2020.08.017>

Reference: YJHIN 6144

To appear in: *Journal of Hospital Infection*

Received Date: 29 July 2020

Accepted Date: 17 August 2020

Please cite this article as: Poller B, Lynch C, Ramsden R, Jessop K, Evans C, Tweed K, Drew C, Bates C, Laundering single use gowns in the event of critical shortage: Experience of a UK Acute Trust, *Journal of Hospital Infection*, <https://doi.org/10.1016/j.jhin.2020.08.017>.

This is a PDF file of an article that has undergone enhancements after acceptance, such as the addition of a cover page and metadata, and formatting for readability, but it is not yet the definitive version of record. This version will undergo additional copyediting, typesetting and review before it is published in its final form, but we are providing this version to give early visibility of the article. Please note that, during the production process, errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

© 2020 The Healthcare Infection Society. Published by Elsevier Ltd. All rights reserved.

**Trust**

Bozena Poller<sup>1</sup>, Christopher Lynch<sup>2</sup>, Reg Ramsden<sup>3</sup>, Karen Jessop<sup>4</sup>, Cariad Evans<sup>1</sup>, Karen Tweed<sup>5</sup>, Caroline Drew<sup>6</sup>, Christine Bates<sup>2</sup>

<sup>1</sup> Virology Department, Sheffield Teaching Hospitals NHS Foundation Trust, Northern General Hospital, Sheffield, S5 7AU, United Kingdom

<sup>2</sup> Microbiology Department, Sheffield Teaching Hospitals NHS Foundation Trust, Northern General Hospital, Sheffield, S5 7AU, United Kingdom

<sup>3</sup> Linen Services, Sheffield Teaching Hospitals NHS Foundation Trust, Northern General Hospital, Sheffield, S5 7AU, United Kingdom

<sup>4</sup> Central Nursing, Sheffield Teaching Hospitals NHS Foundation Trust, Northern General Hospital, Sheffield, S5 7AU, United Kingdom

<sup>5</sup> Decontamination Services, Sheffield Teaching Hospitals NHS Foundation Trust, Northern General Hospital, Sheffield, S5 7AU, United Kingdom

<sup>6</sup> Patient and Healthcare Governance, Sheffield Teaching Hospitals NHS Foundation Trust, Northern General Hospital, Sheffield, S5 7AU, United Kingdom

The COVID-19 pandemic resulted in unprecedented global use of personal protective equipment (PPE) to protect health care workers (HCW). In the UK gowns were recommended for all patient care until the infection was downgraded from a high consequence infectious disease (HCID) by Public Health England (PHE) on 19<sup>th</sup> March 2020 [1]; subsequently gowns were advised as 'airborne PPE' for aerosol generating procedures (AGPs), and in high-risk areas such as critical care [2]. Although elective surgery diminished, reduction in gown use from theatres was outstripped by surge elsewhere; over 126,000 patients were admitted across the UK by July 9<sup>th</sup> [3], with around 17% needing admission to critical care settings [4].

The global demand for PPE exceeded the timely production of gowns which met the required standards. By mid-April, widespread media reports described PPE shortages in the UK, including single-use surgical gowns, leading some organisations to search for alternative strategies to ensure ongoing protection of staff [5].

In Sheffield Teaching Hospitals (STH) we maintained our gown stock through the pandemic but were aware of the concerns; we explored alternative options to ensure we had means of protecting staff if the event of absolute shortage ever occurred. One of these was whether our on-site hospital laundry facility could be used to wash and decontaminate single-use surgical gowns for reuse as part of COVID PPE. We describe here some of the considerations, processes and challenges encountered in setting up and delivering such a system.

at all times. To do this, we produced a risk-assessed hierarchy of options, working alongside the Occupational Safety Management Team. Our aim was to provide a gown alternative for use only in the exceptional event of a critical shortage of single-use gowns, and their use kept under constant review, in particular the availability of higher-ranking options.

We proposed that, if we treated the gowns as fabric items and they physically withstood the process, we could investigate using the hospital laundry system, which is well-established in decontaminating healthcare linen. The hospital laundry has the advantage of allowing high throughput, with less 'hands on' staff time compared to other disinfection methods such as UV radiation or hydrogen peroxide vaporisation, as well as requiring less space.

We had two immediate concerns. The first was the effect that any disinfection method would have on the gown properties, in particular fluid resistance. We planned that washed gowns should not be considered water resistant unless confirmed by testing. The second concern was the safety and intended use, if not fluid resistant. Fabric 'washable' gowns are included in WHO PPE guidance [6], and since by PHE as an option in acute shortage settings [7]. We therefore considered that our washed gowns should be used in accordance with PHE guidance, with a plastic apron worn underneath and forearms washed after use [7]. We stipulated this was only for COVID PPE where a lower bodily fluid exposure was expected, and was not applicable for potential high fluid exposures, including operating theatres.

We then explored the practicalities and steps required to implement a system. Standard STH laundry processes conforming to HTM-01-04 [8] were followed, utilising a washer extractor rather than a continuous tunnel washer to reduce the risk of entanglement and damage. STH linen then routinely undergoes tumble drying; a reduced heat tumble cycle was needed for the delicate gown fabric. Gowns were processed separately from other hospital linen to avoid confusion.

After each wash/dry cycle, gowns were examined by the laundry staff to check integrity of the fabric, absence of tears, and that the hems and cuffs remained intact. During trial runs we noted that gowns required the Velcro to be fastened pre-washing to prevent catching on gown fabric during the laundry cycle. Fabric integrity was also affected by marker pen, and residual glue from stickers or tape; subsequent end-user instructions specified avoiding these.

As mechanical degradation of the gowns was observed with four or more laundry cycles, we decided they should be washed a maximum of three times. In order to 'count' the number of cycles, laundry staff would make a small hole in the posterior bottom edge of the gown.

A collection system from the clinical areas was considered. Gowns that were heavily contaminated were to be discarded as normal, since we appreciated staff may feel uncomfortable with reuse of these, irrespective of whether they could be safely decontaminated. Gowns with defects were also to be discarded. Suitable gowns would be placed in a labelled, separate bin from the rest of the PPE. A health care worker, in PPE, would then prepare the gowns by inspecting and discarding any with defects or with 3 holes in the hem, removing any tape, applying the Velcro tab and finally placing the gown in an alginate bag, to be sent to laundry. An instruction poster was designed for staff outlining which gowns were suitable, the laundry process, and how to prepare the gown for laundry.

PPE supplies and fear of using less protective options. We recognised that although a fabric gown was within guidance, this would be perceived by many as downgrading of PPE. We anticipated needing significant support from our communications and management teams in the event of ever needing to use the washed gowns in clinical care.

Using this system, we successfully washed nearly 2000 gowns. These were stored, and never used for clinical care. Whilst we were reassured that this emergency system could be successfully used, we continued to explore fluid-resistant options, and successfully maintained gown procurement, which remained our priority throughout.

## References

- [1] Public Health England. High consequence infectious diseases (HCID) guidance. Available at: <https://www.gov.uk/guidance/high-consequence-infectious-diseases-hcid> [last accessed July 20, 2020].
- [2] Public Health England. COVID-19 personal protective equipment (PPE) guidance. 2020. Available at: <https://www.gov.uk/government/publications/wuhan-novel-coronavirus-infection-prevention-and-control/covid-19-personal-protective-equipment-ppe> [last accessed July 27, 2020].
- [3] Public Health England. Coronavirus (COVID-19) in the UK: Healthcare in the UK. 2020. Available at: <https://coronavirus-staging.data.gov.uk/healthcare> [last accessed July 20, 2020].
- [4] Docherty AB, Harrison EM, Green CA, Hardwick HE, Pius R, Norman L, et al. Features of 16,749 hospitalised UK patients with COVID-19 using the ISARIC WHO Clinical Characterisation Protocol. MedRxiv 2020. <https://doi.org/10.1101/2020.04.23.20076042>.
- [5] Siddique H. What is the situation with personal protective equipment in the UK? The Guardian: Society. 2020. Available at: <https://www.theguardian.com/world/2020/apr/14/coronavirus-what-is-the-situation-with-ppe-personal-protective-equipment-in-the-uk> [last accessed July 27, 2020].
- [6] World Health Organization. Rational use of personal protective equipment for coronavirus disease (COVID-19) and considerations during severe shortages: interim guidance. 2020. Available at: [https://apps.who.int/iris/bitstream/handle/10665/331695/WHO-2019-nCov-IPC\\_PPE\\_use-2020.3-eng.pdf?ua=1](https://apps.who.int/iris/bitstream/handle/10665/331695/WHO-2019-nCov-IPC_PPE_use-2020.3-eng.pdf?ua=1) [last accessed 19/07/2020].
- [7] Public Health England. Considerations for acute personal protective equipment (PPE) shortages. 2020. Available at: <https://www.gov.uk/government/publications/wuhan-novel-coronavirus-infection-prevention-and-control/managing-shortages-in-personal-protective-equipment-ppe#gowns-and-coveralls> [last accessed July 27, 2020].
- [8] Department of Health and Social Care. Health Technical Memorandum 01-04: Decontamination of linen for health and social care Management and provision. 2016. Available at: <https://www.gov.uk/government/publications/decontamination-of-linen-for-health-and-social-care> [last accessed 19/7/2020].