

PPE and COVID-19: what you need to know

Lindsay Keeley, patient safety and quality lead, at the Association for Perioperative Practice, provides a detailed insight into what healthcare workers need to know about personal protection equipment (PPE) during the COVID-19 pandemic.

As the current Coronavirus pandemic continues to present significant challenges globally and across the United Kingdom (UK), healthcare workers (HCWs) remain at risk from potential transmission of COVID-19, which is a highly infectious respiratory virus. COVID-19 is predominantly passed on from human to human through respiratory (droplet and aerosol) contact routes, according to the World Health Organization.¹ HCWs and patients are at highest risk when they are (within 1) metres of an infected person who has symptoms (e.g. coughing or sneezing) and indirectly through the immediate environment. Airborne transmission of COVID-19 can occur in healthcare settings where there is poor indoor ventilation and where aerosol generated procedures are carried out.

It is essential that HCWs have a comprehensive understanding of basic infection prevention and control.² When performing initial risk assessments, as the Health and Safety Executive points out in its guidance on the Personal Protective Equipment (PPE) at Work Regulations,³ PPE is required to be worn as per standard precautions (SP) in line with these regulations,^{3,4} subject to level of risk of transmission to and from the patient.⁵

PPE is an integral part of SP which must always be used consistently by healthcare providers for all patients in all situations to prevent the spread of infection.²



Transmission based precautions (TBPs) are used for a particular mode of transmission, in this situation COVID-19, when SP are not sufficient in preventing the spread of specific pathogens.

A review of standard infection control precautions (SICPs) and TBPs, should be undertaken and a local standard operating policy (SOP) is required in the healthcare settings to reassess current practice in line with Public Health England⁶⁻⁸ guidance for infection prevention and control of COVID-19. A second-tier strategy measure for all Aerosol Generated Procedures (AGPs) must include patients known or suspected to be COVID-19 positive.

Standard Precautions (SPs)

- Applies to all blood, bodily fluids, secretions, and excretions.
- Includes hand hygiene, after each patient contact.
- Refers to the use of barrier precautions (PPE), gloves, gowns, and facial protection.

Transmission Based Precautions (TBPs)

- Direct contact with the patient or indirect contact with the patient's environment.
- Droplet transmission when the recipient encounters significant respiratory particles.
- Airborne transmission when microscopic particles remain in the air and are infective overtime.

Legislative requirement of PPE

Legislation laid down in law by the Health and Safety at Work Act (HSWA 1974)⁹ states it is a legal requirement to protect the health and safety of all workers and those effected by work activities. Employers under the HSWA (1974), PPEWR (regulation 4, 1992)¹⁰ and the Management of Health and Safety at Work Regulations (MHSWR 1999)¹¹ must provide suitable PPE to protect each employee against exposure of infection and risks associated while at work (HSE 2015).³

- Employees are also responsible for complying with current legislation and ►

Requirement	I surgical Mask (EN14683)	IR surgical Mask	II surgical Mask	IIR surgical Mask	FFP1 respirator (EN149:2001 +A1:2009)	FFP2 = N95 respirator (EN149:2001 +A1:2009)	FFP3 respirator (EN149:2001 +A1:2009)
Assigned protection factor	Low	Moderate	Moderate	Moderate	Protection level 4	Protection level 10	Protection level 20 (high)
Filter efficiency	95% bacterial filtration efficiency	95% bacterial filtration efficiency	98% bacterial filtration efficiency	98% bacterial filtration efficiency	>80% bacterial filtration efficiency	94% inward leakage 8%	99% inward leakage 2%
Resistance	Direction of exhalation (inside to outside)	Direction of exhalation (inside to outside)	Direction of exhalation (inside to outside)	Direction of exhalation (inside to outside)	Direction of (outside to inside)	Direction of (outside to inside)	Direction of (outside to inside)
	Does not protect wearer from airborne particles such as COVID-19 protects wearer from infecting the surrounding environment	Does not protect wearer from airborne particles such as COVID-19 protects wearer from infecting the surrounding environment	Not effective against blood or bodily fluids Does not protect wearer from airborne particles such as COVID-19 protects wearer from infecting the surrounding environment	Protects others from wearer transmitting infection Does not protect wearer from airborne particles such as COVID-19 protects against blood and other bodily fluids	protects others from wearer transmitting infection	protects others from wearer transmitting infection Meets WHO guidelines protection from COVID-19 Maybe used if FFP3 respirator is not available. Requires fit testing. N95 protects wearer from viral transmission, requires face fit testing, not CE marked, used for AGP's	Have a valve to help breath as the filtration material is much thicker protects others from wearer transmitting infection Recommended for AGPs (high protection)
Splash resistant	Not splash resistant	Splash resistant layer, protects against blood and other bodily fluids	Not splash resistant 3 ply layer prevents large particles from reaching patient or working services	Splash resistant 4 ply layer prevents large particles from reaching patient or working services	Effective against solid or liquid	Effective against solid or liquid	Effective against solid or liquid

Table 1 (compiled from rapid evidence review report) HSE 2020

When looking at PPE use in healthcare, it is important to consider and understand the risks rather than the hazards, especially around the hierarchy of AGPs, in pandemic situations, such as this. This should help inform the risk process relating to the above provision of PPE. This can be achieved through good visual communication via the intranet, HSE, PHE, and NHS England.

PHE^{16,17,18} has provided PPE clinical recommendations guidance for healthcare

workers in the NHS and independent sector, they have also provided additional guidance, and infection prevention control precautions where there is sustained transmission of COVID-19 which I strongly advise reviewing. **CSJ**

References

1 World Health Organization (2020). Modes of transmission of virus causing COVID-19: implications for IPC precaution recommendations

<https://www.who.int/news-room/commentaries/detail/modes-of-transmission-of-virus-causing-covid-19-implications-for-ipc-precaution-recommendations> [Accessed March 2020]

2 WHO, Infection Prevention and Control (IPC) for Novel Coronavirus (COVID-19) Course. <https://openwho.org/courses/COVID-19-IPC-EN> [Accessed October 2020]

3 Health and Safety Executive, 2015. Personal Protective Equipment at Work Regulations 1992: Guidance on Regulations. [Online]. Available from:

<http://www.hse.gov.uk/contact/faqs/ppe.htm> [Accessed November 2020].

4 Personal Protective Equipment Regulations 1992 EC Directive 3139 Norwich, The Stationery Office

5 Brown, L. Munro, J. Rogers, S. (2019). Use of personal protective equipment in nursing practice. *Nursing Standard*. Vol 34. No 5. pg.59-66.

6 Public Health England (2020) COVID-19: personal protective equipment use for aerosol generating procedures. <https://www.gov.uk/government/publications/covid-19-personal-protective-equipment-use-for-aerosol-generating-procedures> [Accessed August 2020]

7 Public Health England (2020). COVID-19: Guidance for the remobilisation of services within health and care settings. Infection prevention and control recommendations. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/910885/COVID-19_Infection_prevention_and_control_guidance_FINAL_PDF_20082020.pdf [Accessed August 2020]

8 Public Health England (2020). New government recommendations for England NHS hospital trusts and private hospital providers. <https://www.gov.uk/government/publications/wuhan-novel-coronavirus-infection-prevention-and-control/new-government-recommendations-for-england-nhs-hospital-trusts-and-private-hospital-providers> [Accessed October 2020]

9 Health and Safety at Work Act (HSWA 1974), accessed at: <https://www.legislation.gov.uk/>

<http://www.hse.gov.uk/contact/faqs/ppe.htm>

10 The Personal Protective Equipment at Work Regulations 1992, accessed at: <https://www.legislation.gov.uk/uk/si/1992/2966/contents/made>

11 Management of Health and Safety at Work Regulations 1999. Accessed at: <https://www.legislation.gov.uk/uk/si/1999/3242/contents/made>

12 Health and Safety Executive 2014 Risk assessment. A brief guide to controlling risks in the workplace Available from: <http://www.hse.gov.uk/pubns/indg163.pdf> [Accessed November 2020]

13 Annex I of Regulation (EU) 2016/425

14 The Association for Perioperative Practice standards and recommendations (2020). Infection Control. <https://www.afpp.org.uk/news?page=3> [Accessed July 20220].

15 The Personal Protective Equipment Enforcement www.legislation.gov.uk/uk/si/2018/1106/contents/made The Personal Protective Equipment (Enforcement) Regulations 2018. You are here: UK Statutory Instruments. [Accessed October 2020]

16 PHE, Quick Guide, Putting on (donning) personal protective equipment (PPE), (2020). Accessed at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/911332/PHE_COVID-19_Donning_Airborne_Protections_quick_guide_gown_version.pdf

17 PHE guidance on the use of PPE for non-AGPs, (2020). Accessed at: <https://www.gov.uk/government/publications/covid-19-personal-protective-equipment-use-for-non-aerosol-generating-procedures>

18 Public Health England (PHE) guidance for the use of personal protective equipment (PPE), (2020). Accessed at: <https://www.gov.uk/government/publications/wuhan-novel-coronavirus-infection-prevention-and-control>

19 EU Medical Device Directive 93/42/EEC. Accessed at: <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:1993L0042:20071011:en:PDF>

20 Medical Device Regulation 2017/745 (MDR), accessed at: <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32017R0745&from=EN>

21 BS EN 455-2:2009 + A2:2013, Medical gloves for single use. Requirements and testing for physical properties, <https://shop.bsigroup.com/ProductDetail?pid=00000000030279772>

22 BS EN 13795-1:2019, Surgical clothing and drapes. Requirements and test methods. Surgical drapes and gowns, April 2019. Accessed at: <https://shop.bsigroup.com/ProductDetail?pid=00000000030358659>

23 Health Protection Scotland, 2015a. Standard Infection Control Precautions Literature Review: Personal Protective Equipment (PPE) – Footwear.

24 World Health Organization 2020 Infection Prevention and Control Guidance for COVID-19 available at <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/infection-prevention-and-control> [Accessed October 2020]

25 Personal protective equipment at work Personal



- Protective Equipment at Work Regulations 1992, <https://www.hse.gov.uk/pubns/priced/l25.pdf>
- 26 Health Protection Scotland, 2015b. National Infection Prevention and Control Manual.
- 27 BS EN ISO 20347:2012, Personal protective equipment. Occupational footwear, February 2012, <https://shop.bsigroup.com/ProductDetail/?pid=00000000030279772>
- 28 Center for Disease Control. Zhen-Dong Guo, et al. (2020) Aerosol and Surface Distribution of Severe Acute Respiratory Syndrome Coronavirus 2 in Hospital Wards, Wuhan, China. Volume 26, Number 7-July 2020. https://wwwnc.cdc.gov/eid/article/26/7/20-0885_article [Accessed July 2020].
- 29 Health and Safety Executive (2020) Risk at Work - Personal protective equipment (PPE) – HSE [Accessed 2020]
- 30 Health and Safety Executive (2020). The Personal Protective Equipment at Work Regulations 1992 Types of RPE - Respiratory protective equipment (RPE) <https://www.hse.gov.uk/respiratory-protective-equipment/types-rpe.htm> [Accessed October 2020]
- 31 European standards EN149:2001, Respiratory protective devices - Filtering half masks to protect against particles - Requirements, testing, marking. https://standards.cen.eu/dyn/www/?p=204:110:0:::FSP_PROJECT,FSP_ORG_ID:32928,6062&cs=1FC98AD34A5EE26A0CB5A6155ED4D6E5E
- 32 HSE, Guidance on respiratory protective equipment (RPE) fit testing, 2019. Accessed at: <https://www.hse.gov.uk/pubns/indg479.pdf>
- 33 NHS England and NHS Improvement, 2019. Standard infection control precautions: national hand hygiene and personal protective equipment policy.
- 34 NHS England and NHS Improvement (2020). Personal protective equipment <https://www.england.nhs.uk/coronavirus/secondary-care/infection-control/ppe/> [Accessed October 2020].
- 35 MHRA 2015 Managing Medical Devices https://www.gov.uk/uploads/system/uploads/attachment_data/file/421028/Managing_medical_devices_-_Apr_2015.pdf

Lindsay Keeley

Lindsay Keeley, RGN, BSc (Hons) has a degree in professional nursing studies, and is currently the patient safety and quality lead for the Association of Perioperative Practice (AfPP). Lindsay is part of the AfPP HQ team, supporting members with guidance on best practice and professional advice, particularly around patient safety and quality. As part of her role, she holds an honorary contract working in practice at Harrogate District Hospital. Previous AfPP roles include Northern & Yorkshire team leader, ophthalmic sig lead, link

member and member of the governance committee. Lindsay was also RCN learning representative and chair of the RCN West Yorkshire Branch. Lindsay's previous job was team leader/surgical first assistant with extended skills and practice educator for theatres at Spire Hospital, Leeds. A registered nurse with over 30 years' experience, she has spent most of her career in perioperative practice, across both the NHS and independent sector working in several specialties, including ENT and Ophthalmics.

Further reading

- Health Protection Scotland, 2015b. National Infection Prevention and Control Manual.
- Health Protection Scotland (2015) Standard Infection Control Precautions Literature Review available at <http://www.hps.scot.nhs.uk/haic/ic/index.aspx> [Accessed October 2020]
- Public Health England (2020). COVID-19: epidemiology, virology and clinical features <https://www.gov.uk/government/publications/wuhan-novel-coronavirus-background-information/wuhan-novel-coronavirus-epidemiology-virology-and-clinical-features#transmission> [Accessed November 2020]
- Health and Safety Executive (2015) Respiratory protective equipment at work: a practical guide. Updated August 2020. <https://www.hse.gov.uk/pubns/books/hsg53.htm> [Accessed August 2020]
- Rational use of PPE for COVID-19. https://apps.who.int/iris/bitstream/handle/10665/331498/WHO-2019-nCoV-IPCPE_use-2020.2-eng.pdf [Accessed October 2020]
- The New PPE Regulation (EU) 2016/425 – IOSH [www.iosh.co.uk > Documents > Networks > Branch Page 1. 1. The New. PPE Regulation \(EU\) 2016/425](http://www.iosh.co.uk/Documents/Networks/BranchPage1.1.TheNew.PPE.Regulation(EU)2016/425). [Accessed November 2020]
- Approval by Health and Safety Executive for use of coveralls as an alternative option for non-surgical gowns FFP3 respirators and other facial personal protective equipment (PPE)
- Health and Safety Executive 2013a Workplace health, safety and welfare regulations 1992: Approved code of practice and guidelines Available from: <http://www.hse.gov.uk/pubns/priced/l24.pdf> [Accessed November 2020]
- Guidance for the selection of PPE <https://www.cdc.gov/hai/pdfs/ppe/ppeslides6-29-04.pdf> [Accessed November 2020]
- Medicines and Healthcare Products Regulatory Agency (MHRA) 2015 Managing Medical Devices https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/421028/Managing_medical_devices_-_Apr_2015.pdf [Accessed October 2020]
- British Standards Institution. Personal protective equipment — Occupational footwear. [Online.] Available: <https://www.iso.org/obp/ui/#iso:std:iso:20347:ed-2:v1:en> [Accessed 03.09.19].
- Removal of (doffing) personal protective equipment (PPE) https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/911334/PHE_COVID-19_Doffing_PPE_Airborne_Precautions_gown_version.pdf [Accessed March 2020]
- Supply of personal protective equipment (PPE) and other supplies <https://www.england.nhs.uk/coronavirus/secondary-care/infection-control/ppe/supply-of-personal-protective-equipment-ppe-and-other-supplies/> [Accessed March 2020]
- NHS England and NHS Improvement 2020 Uniforms and workwear: guidance for NHS employers Uniforms and workwear <https://www.england.nhs.uk/publication/uniforms-and-workwear-guidance-for-nhs-employers/> [Accessed April 2020]
- Council Directive 93/42/EEC of 14 June 1993 concerning medical devices <https://www.legislation.gov.uk/eudr/1993/42/2020-12-31> [Accessed March 2020]
- Modes of transmission of virus causing COVID-19: implications for IPC precaution recommendations Scientific brief 29 March 2020 <https://www.who.int/news-room/commentaries/detail/modes-of-transmission-of-virus-causing-covid-19-implications-for-ipc-precaution-recommendations>
- Health Protection Scotland (2015) Standard Infection Control Precautions Literature Review available at <http://www.hps.scot.nhs.uk/haic/ic/index.aspx> [Accessed October 2020]