# Evidence Search Service Results of your search request

## COVID-19: PPE

**ID of request:** 22701  
**Date of request:** 14th April, 2020  
**Date of completion:** 21st April, 2020

If you would like to request any articles or any further help, please contact:  Tom Roper at [tom.roper@nhs.net](mailto:tom.roper@nhs.net)

Please acknowledge this work in any resulting paper or presentation as: Evidence search: COVID-19: PPE. Tom Roper. (21st April, 2020). BRIGHTON, UK: Brighton and Sussex Library and Knowledge Service.

**Sources searched**  
Cochrane Library (2)  
Dimensions (0)  
Evidence Aid (1)  
Joanna Briggs Institute (1)  
MEDLINE (9)  
NICE Evidence Search (0)  
NIH iSearch COVID-19 portfolio (1)  
Semantic Scholar (0)  
TRIP Database (0)

**Date range used** (5 years, 10 years): 2019 onwards   
**Limits used** (gender, article/study type, etc.): Clinical query filters   
**Search terms and notes** (full search strategy for database searches below):

Relevant natural language and controlled vocabulary terms were selected and combined. Thesaurus terms were adapted for different databases. Final result sets were de-duplicated and reviewed for relevance by the searcher, irrelevant results being discarded.

For more information about the resources please go to: <https://www.bsuh.nhs.uk/library/>.

## Contents

[A. Synopses or Summaries](#Content2)

Cochrane Database of Systematic Reviews

[Barriers and facilitators to healthcare workers’ adherence with infection prevention and control (IPC) guidelines for respiratory infectious diseases: a rapid qualitative evidence synthesis](#Research627886)

Evidence Aid

[N95 respirators and surgical masks for preventing transmission of respiratory infections to healthcare workers](#Research627888)

Joanna Briggs Institute

[COVID-19 special collection: Evidence-based infection prevention and control](#Research627887)

[B. Systematic Reviews](#Content3)

Cochrane Database of Systematic Reviews

[Personal protective equipment for preventing highly infectious diseases due to exposure to contaminated body fluids in healthcare staff](#Research627865)

[C. Original Research](#Content5)

1. [Challenges and solutions for addressing critical shortage of supply chain for personal and protective equipment (PPE) arising from Coronavirus disease (COVID19) pandemic - Case study from the Republic of Ireland.](#Research627881)
2. [Containing COVID-19 in the emergency room: the role of improved case detection and segregation of suspect cases.](#Research627876)
3. [Coronavirus Disease (COVID-19): A primer for emergency physicians.](#Research627878)
4. [COVID-19 Personal Protective Equipment (PPE) for the emergency physician](#Research627885)
5. [Electronic Personal Protective Equipment: A Strategy to Protect Emergency Department Providers in the Age of COVID-19.](#Research627877)
6. [Headaches Associated With Personal Protective Equipment - A Cross-Sectional Study Among Frontline Healthcare Workers During COVID-19.](#Research627879)
7. [Hospital surge capacity in a tertiary emergency referral centre during the COVID-19 outbreak in Italy.](#Research627882)
8. [Novel 2019 coronavirus SARS-CoV-2 (COVID-19): An updated overview for emergency clinicians](#Research627880)
9. [Personal protective equipment during the COVID-19 pandemic - a narrative review.](#Research627883)
10. [The Italian coronavirus disease 2019 outbreak: recommendations from clinical practice.](#Research627884)

### [D. Search History](#SearchHistory)

## A. Synopses or Summaries

#### Cochrane Database of Systematic Reviews

**Barriers and facilitators to healthcare workers’ adherence with infection prevention and control (IPC) guidelines for respiratory infectious diseases: a rapid qualitative evidence synthesis** (2020)

Houghton C., Meskell P., Delaney H., Smalle M., Glenton C., Booth A., Chan XHS, Devane D., Biesty LM.

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=d49f0ab0e0fc498bbfbfc17d9bf90497)

Healthcare workers point to several factors that influence their ability and willingness to follow IPC guidelines when managing respiratory infectious diseases. These include factors tied to the guideline itself and how it is communicated, support from managers, workplace culture, training, physical space, access to and trust in personal protective equipment, and a desire to deliver good patient care. The review also highlights the importance of including all facility staff, including support staff, when implementing IPC guidelines.

#### Evidence Aid

**N95 respirators and surgical masks for preventing transmission of respiratory infections to healthcare workers** (2020)

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=d0119bbdc7737975beb74245bcd1220a)

What works: Medical masks and N95 respirators reduce the risk of respiratory infection when worn by healthcare workers. N95 respirators provide greater protection than medical masks against some types of respiratory infection when worn by healthcare workers, but universal use of N95 respirators throughout a work shift is likely to be less acceptable due to greater discomfort. What doesn’t work: Disposable, cotton or paper masks are not recommended for protecting healthcare workers from respiratory infection. What’s uncertain: In a 2015 review, there was insufficient economic evidence relating to the use of masks or respirators for reducing transmission of respiratory viruses. When considering the costs of these devices, costs should include those of the device itself and the associated fit testing and training.

#### Joanna Briggs Institute

**COVID-19 special collection: Evidence-based infection prevention and control** (2020)

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=4ea4d66334da8e600657c25dcd2008a5)

See evidence summaries on: 1. Respiratory Infection: Reuse, or Extended Use, of Disposable Masks and Respirators and 2. Non-Sterile Gloves: Appropriate Use in Healthcare Settings

## B. Systematic Reviews

#### Cochrane Database of Systematic Reviews

**Personal protective equipment for preventing highly infectious diseases due to exposure to contaminated body fluids in healthcare staff** (2020)

Verbeek JH, Rajamaki B., Ijaz S., Sauni R., Toomey E., Blackwood B., Tikka C., Ruotsalainen JH, Kilinc Balci FS.

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=166827f3aafe19233f0a4b388d22177d)

We found low‐ to very low‐certainty evidence that covering more parts of the body leads to better protection but usually comes at the cost of more difficult donning or doffing and less user comfort, and may therefore even lead to more contamination. More breathable types of PPE may lead to similar contamination but may have greater user satisfaction. Modifications to PPE design, such as tabs to grab, may decrease the risk of contamination. For donning and doffing procedures, following CDC doffing guidance, a one‐step glove and gown removal, double‐gloving, spoken instructions during doffing, and using glove disinfection may reduce contamination and increase compliance. Face‐to‐face training in PPE use may reduce errors more than folder‐based training. We still need RCTs of training with long‐term follow‐up. We need simulation studies with more participants to find out which combinations of PPE and which doffing procedure protects best. Consensus on simulation of exposure and assessment of outcome is urgently needed. We also need more real‐life evidence. Therefore, the use of PPE of HCW exposed to highly infectious diseases should be registered and the HCW should be prospectively followed for their risk of infection.

## C. Original Research

1. **Challenges and solutions for addressing critical shortage of supply chain for personal and protective equipment (PPE) arising from Coronavirus disease (COVID19) pandemic - Case study from the Republic of Ireland.**  
   Rowan Neil J. The Science of the total environment 2020;725:138532.

Coronavirus (COVID-19) is highly infectious agent that causes fatal respiratory illnesses, which is of great global public health concern. Currently, there is no effective vaccine for tackling this COVID19 pandemic where disease countermeasures rely upon preventing or slowing person-to-person transmission. Specifically, there is increasing efforts to prevent or reduce transmission to front-line healthcare workers (HCW). However, there is growing international concern regarding the shortage in supply chain of critical one-time-use personal and protective equipment (PPE). PPE are heat sensitive and are not, by their manufacturer's design, intended for reprocessing. Most conventional sterilization technologies used in hospitals, or in terminal medical device sterilization providers, cannot effectively reprocess PPE due to the nature and severity of sterilization modalities. Contingency planning for PPE stock shortage is important. Solutions in the Republic of Ireland include use of smart communication channels to improve supply chain, bespoke production of PPE to meets gaps, along with least preferred option, use of sterilization or high-level disinfection for PPE reprocessing. Reprocessing PPE must consider material composition, functionality post treatment, along with appropriate disinfection. Following original manufacturer of PPE and regulatory guidance is important. Technologies deployed in the US, and for deployment in the Republic of Ireland, are eco-friendly, namely vaporised hydrogen peroxide (VHP), such as for filtering facepiece respirators and UV irradiation and High-level liquid disinfection (Actichlor+) is also been pursed in Ireland. Safeguarding supply chain of PPE will sustain vital healthcare provision and will help reduce mortality.

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=59e279a8f06c4ed9d4cd16100170a4e5)

1. **Containing COVID-19 in the emergency room: the role of improved case detection and segregation of suspect cases.**  
   Wee Liang En Academic emergency medicine : official journal of the Society for Academic Emergency Medicine 2020;:No page numbers.

AIMSPatients with COVID-19 may present with respiratory syndromes indistinguishable from common viruses. This poses a challenge for early detection during triage at the emergency department (ED). Over a 3-month period, our ED aimed to minimise nosocomial transmission by using broader suspect case criteria for better detection and using appropriate personal protective equipment (PPE) for healthcare workers (HCWs) METHODS: All ED admissions with respiratory syndromes over a 3-month period were tested for COVID-19. The sensitivity and specificity of screening criteria in detecting COVID-19 was assessed. A risk-stratified approach was adopted for PPE usage in the ED, based on high-risk "fever areas" and lower-risk zones. When a case of COVID-19 was confirmed, surveillance was conducted for potentially exposed patients and HCWs.RESULTSA total of 1,841 cases presenting with respiratory syndromes required admission over the study period. Amongst these, 70 cases of COVID-19 were subsequently confirmed. The majority (84.2%, 59/70) were picked up at ED triage as they fulfilled suspect case criteria. Of these, 34 met the official screening criteria; another 25 were picked up by the broader internal screening criteria. Over the 12-week period, the cumulative sensitivity of internal screening criteria was 84.3% (95% confidence interval, CI=73.6%-91.9%), whereas the sensitivity of the official screening criteria was 48.6% (95%CI=36.4%- 60.8%). Given the broadened internal criteria, the pre-existing ED "fever area" was insufficient and had to be expanded. However, there were no cases of nosocomial transmission from intra-ED exposure, despite extensive surveillance.CONCLUSIONFrontline physicians need to be given leeway to decide on the disposition of cases based on clinical suspicion during an ongoing outbreak of COVID-19. If a broader criterion is used at ED triage, ED facilities and isolation facilities need to be readied to accommodate a surge of suspect cases. Usage of appropriate PPE is essential in minimising nosocomial transmission.

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[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=9ba7ae65920a4f07b3888ba6bc4b962b)

1. **Coronavirus Disease (COVID-19): A primer for emergency physicians.**  
   Chavez Summer The American journal of emergency medicine 2020;:No page numbers.

INTRODUCTIONRapid worldwide spread of Coronavirus Disease 2019 (COVID-19) has resulted in a global pandemic.OBJECTIVEThis review article provides emergency physicians with an overview of the most current understanding of COVID-19 and recommendations on the evaluation and management of patients with suspected COVID-19.DISCUSSIONSevere Acute Respiratory Syndrome coronavirus 2 (SARS-CoV-2), the virus responsible for causing COVID-19, is primarily transmitted from person-to-person through close contact (approximately 6 ft) by respiratory droplets. Symptoms of COVID-19 are similar to other viral upper respiratory illnesses. Three major trajectories include mild disease with upper respiratory symptoms, non-severe pneumonia, and severe pneumonia complicated by acute respiratory distress syndrome (ARDS). Emergency physicians should focus on identifying patients at risk, isolating suspected patients, and informing hospital infection prevention and public health authorities. Patients with suspected COVID-19 should be asked to wear a facemask. Respiratory etiquette, hand washing, and personal protective equipment are recommended for all healthcare personnel caring for suspected cases. Disposition depends on patient symptoms, hemodynamic status, and patient ability to self-quarantine.CONCLUSIONThis narrative review provides clinicians with an updated approach to the evaluation and management of patients presenting to the emergency department with suspected COVID-19.

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=b17d227a96457661f6960edc0e896e63)

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=d4fb28a41cf5c07c85f14364f8c1e3ae)

1. **COVID-19 Personal Protective Equipment (PPE) for the emergency physician**  
   Holland M. Visual Journal of Emergency Medicine 2020;:10.1016/j.visj.2020.100740.

Describes recommendations in the USA

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=8fe2fd21ec0ff56f77610db86bf7dcdc)

1. **Electronic Personal Protective Equipment: A Strategy to Protect Emergency Department Providers in the Age of COVID-19.**  
   Turer Robert W. Journal of the American Medical Informatics Association : JAMIA 2020;:No page numbers.

Emergent policy changes related to telemedicine and the Emergency Medical Treatment and Labor Act (EMTALA) during the novel coronavirus pandemic (COVID-19) have created opportunities for technology-based clinical evaluation, which serves to conserve personal protective equipment (PPE) and protect emergency providers. We define electronic personal protective equipment (ePPE) as an approach using telemedicine tools to perform electronic medical screening exams while satisfying EMTALA. We discuss the safety, legal, and technical factors necessary for implementing such a pathway. This approach has the potential to conserve PPE and protect providers while maintaining safe standards for medical screening exams in the ED for low risk patients in whom COVID-19 is suspected.

1. **Headaches Associated With Personal Protective Equipment - A Cross-Sectional Study Among Frontline Healthcare Workers During COVID-19.**  
   Ong Jonathan J. Y Headache 2020;:No page numbers.

BACKGROUNDCoronavirus disease 2019 (COVID-19) is an emerging infectious disease of pandemic proportions. Healthcare workers in Singapore working in high-risk areas were mandated to wear personal protective equipment (PPE) such as N95 face mask and protective eyewear while attending to patients.OBJECTIVESWe sought to determine the risk factors associated with the development of de novo PPE-associated headaches as well as the perceived impact of these headaches on their personal health and work performance. The impact of COVID-19 on pre-existing headache disorders was also investigated.METHODSThis is a cross-sectional study among healthcare workers at our tertiary institution who were working in high-risk hospital areas during COVID-19. All respondents completed a self-administered questionnaire.RESULTSA total of 158 healthcare workers participated in the study. Majority [126/158 (77.8%)] were aged 21-35 years. Participants included nurses [102/158 (64.6%)], doctors [51/158 (32.3%)], and paramedical staff [5/158 (3.2%)]. Pre-existing primary headache diagnosis was present in about a third [46/158 (29.1%)] of respondents. Those based at the emergency department had higher average daily duration of combined PPE exposure compared to those working in isolation wards [7.0 (SD 2.2) vs 5.2 (SD 2.4) hours, P < .0001] or medical ICU [7.0 (SD 2.2) vs 2.2 (SD 0.41) hours, P < .0001]. Out of 158 respondents, 128 (81.0%) respondents developed de novo PPE-associated headaches. A pre-existing primary headache diagnosis (OR = 4.20, 95% CI 1.48-15.40; P = .030) and combined PPE usage for >4 hours per day (OR 3.91, 95% CI 1.35-11.31; P = .012) were independently associated with de novo PPE-associated headaches. Since COVID-19 outbreak, 42/46 (91.3%) of respondents with pre-existing headache diagnosis either "agreed" or "strongly agreed" that the increased PPE usage had affected the control of their background headaches, which affected their level of work performance.CONCLUSIONMost healthcare workers develop de novo PPE-associated headaches or exacerbation of their pre-existing headache disorders.

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[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=80b790c8a43256252fd5620bcfc1b7bb)

1. **Hospital surge capacity in a tertiary emergency referral centre during the COVID-19 outbreak in Italy.**  
   Carenzo L. Anaesthesia 2020;:No page numbers.

The first person-to-person transmission of the 2019-novel coronavirus in Italy on 21 February 2020 led to an infection chain that represents one of the largest known COVID-19 outbreaks outside Asia. In Northern Italy in particular, we rapidly experienced a critical care crisis due to a shortage of intensive care beds, as we expected according to data reported in China. Based on our experience of managing this surge, we produced this review to support other healthcare services in preparedness and training of hospitals during the current coronavirus outbreak. We had a dedicated task force that identified a response plan, which included: (1) establishment of dedicated, cohorted intensive care unit(s) (ICU) for COVID-19-positive patients; (2) design of appropriate procedures for pre-triage, diagnosis and isolation of suspected and confirmed cases; and (3) training of all staff to work in the dedicated ICU in personal protective equipment use and patient management. Hospital multidisciplinary and departmental collaboration was needed to work on all principles of surge capacity, including: space definition; supplies provision; staff recruitment; and ad-hoc training. Dedicated protocols were applied where full isolation of spaces, staff and patients was implemented. Opening the unit and the whole hospital emergency process required a multidisciplinary, multilevel involvement of healthcare providers and hospital managers all working towards a common goal: patient care and hospital safety. Hospitals should be prepared to face severe disruptions to their routine and it is very likely that protocols and procedures might require re-discussion and update on a daily basis.

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[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=7a06056a5fe78a4ca360d74a85259aa4)

1. **Novel 2019 coronavirus SARS-CoV-2 (COVID-19): An updated overview for emergency clinicians**  
   Giwa A. L Emergency medicine practice 2020;22(5):1-28.

The novel coronavirus, COVID-19, has quickly become a worldwide threat to health, travel, and commerce. This overview analyzes the best information from the early research, including epidemiologic and demographic features from SARS-CoV-1 and MERS-CoV viruses; lessons learned from the experience of an emergency physician in Northern Italy, where the outbreak has devastated the healthcare system; evidence on transmission and prevention through safe use of PPE; evidence and advice on SARS-CoV-2 testing and co-infection; management options; airway management options; steps for rapid sequence intubation in the ED and managing disaster ventilation; and information on managing pediatric and pregnant patients.

1. **Personal protective equipment during the COVID-19 pandemic - a narrative review.**  
   Cook T. M Anaesthesia 2020;:No page numbers.

Personal protective equipment has become an important and emotive subject during the current coronavirus (COVID-19) epidemic. COVID-19 is predominantly caused by contact or droplet transmission attributed to relatively large respiratory particles which are subject to gravitational forces and travel only approximately one metre from the patient. Airborne transmission may occur if patient respiratory activity or medical procedures generate respiratory aerosols. These aerosols contain particles that may travel much longer distances and remain airborne longer, but their infective potential is uncertain. Contact, droplet and airborne transmission are each relevant during airway manoeuvres in infected patients, particularly during tracheal intubation. Personal protective equipment is an important component, but only one part, of a system protecting staff and other patients from COVID-19 cross-infection. Appropriate use significantly reduces risk of viral transmission. Personal protective equipment should logically be matched to the potential mode of viral transmission occurring during patient care - contact, droplet, or airborne. Recommendations from international organisations are broadly consistent, but equipment use is not. Only airborne precautions include a fitted high-filtration mask, and this should be reserved for aerosol-generating procedures. Uncertainty remains around certain details of personal protective equipment including use of hoods, mask type and the potential for re-use of equipment.

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[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=d40c66fee16c8a4fd862bba7f431e817)

1. **The Italian coronavirus disease 2019 outbreak: recommendations from clinical practice.**  
   Sorbello M. Anaesthesia 2020;:No page numbers.

Novel coronavirus 2019 is a single-stranded, ribonucleic acid virus that has led to an international pandemic of coronavirus disease 2019. Clinical data from the Chinese outbreak have been reported, but experiences and recommendations from clinical practice during the Italian outbreak have not. We report the impact of the coronavirus disease 2019 outbreak on regional and national healthcare infrastructure. We also report on recommendations based on clinical experiences of managing patients throughout Italy. In particular, we describe key elements of clinical management, including: safe oxygen therapy; airway management; personal protective equipment; and non-technical aspects of caring for patients diagnosed with coronavirus disease 2019. Only through planning, training and team working will clinicians and healthcare systems be best placed to deal with the many complex implications of this new pandemic.

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[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=fe44957f05131e77b4ce30991a2b087b)

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### Opening Internet Links

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### Full text papers

Links are given to full text resources where available. For some of the papers, you will need an **NHS OpenAthens Account**. If you do not have an account you can [register online](https://openathens.nice.org.uk/).

You can then access the papers by simply entering your username and password. If you do not have easy access to the internet to gain access, please let us know and we can download the papers for you.

### Guidance on searching within online documents

Links are provided to the full text of each document. Relevant extracts have been copied and pasted into these results. Rather than browse through lengthy documents, you can search for specific words as follows:

**Portable Document Format / pdf / Adobe**  
Click on the Search button (illustrated with binoculars). This will open up a search window. Type in the term you need to find and links to all of the references to that term within the document will be displayed in the window. You can jump to each reference by clicking it.

**Word documents**  
Select Edit from the menu, the Find and type in your term in the search box which is presented. The search function will locate the first use of the term in the document. By pressing 'next' you will jump to further references.

## D. Search History

|  | **Source** | **Criteria** | **Results** |
| --- | --- | --- | --- |
| 1. | Medline | exp \*BETACORONAVIRUS/ | 5564 |
| 2. | Medline | exp \*"CORONAVIRUS INFECTIONS"/ | 8917 |
| 3. | Medline | ("2019-nCoV" OR 2019nCoV OR nCoV2019 OR "nCoV-2019" OR "COVID-19" OR COVID19 OR "WN-CoV" OR WNCoV OR "HCoV-19" OR HCoV19 OR CoV OR "2019 novel\*" OR Ncov OR "n-cov" OR "SARS-CoV-2" OR "SARSCoV-2" OR "SARSCoV2" OR "SARS-CoV2" OR SARSCov19 OR "SARS-Cov19" OR "SARSCov-19" OR "SARS-Cov-19").ti,ab | 9363 |
| 4. | Medline | ((new OR novel OR wuhan OR chinese) ADJ coronavir\*).ti,ab | 1541 |
| 5. | Medline | (1 OR 2 OR 3 OR 4) | 18565 |
| 6. | Medline | ("personal protective equipment" OR PPE).ti,ab | 4932 |
| 7. | Medline | (5 AND 6) | 190 |
| 8. | Medline | "EMERGENCY SERVICE, HOSPITAL"/ | 66729 |
| 9. | Medline | \*EMERGENCY MEDICINE/ OR \*EMERGENCY MEDICAL SERVICES/ | 39254 |
| 10. | Medline | (emergency ADJ2 (department\* OR unit OR units OR room\*)).ti,ab | 110219 |
| 11. | Medline | ("accident and emergency" OR "accident & emergency").ti,ab | 4638 |
| 12. | Medline | (8 OR 9 OR 10 OR 11) | 167025 |
| 13. | Medline | (5 AND 7 AND 12) | 9 |
| 14. | Medline | (5 AND 7) | 190 |
| 15. | Medline | 5 AND 7 [DT FROM 2019] [Clinical queries reviews-balance OR therapy-balance OR diagnosis-balance OR prognosis-balance OR causation-etiology-balance OR economics-balance OR costs-balance] | 65 |

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