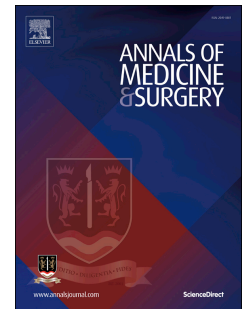


# Journal Pre-proof

Contact dermatitis due to personal protective equipment use and hygiene practices during the COVID-19 pandemic: A systematic review of case reports

Zouina Sarfraz, Azza Sarfraz, Muzna Sarfraz, Miguel Felix, Jonathan A. Bernstein, Luz Fonacier, Ivan Cherrez-Ojeda



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**Title:** Contact Dermatitis due to Personal Protective Equipment Use and Hygiene Practices during the COVID-19 Pandemic: A Systematic Review of Case Reports

**Short Title:** Contact Dermatitis, PPE and COVID-19

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**Title:** Contact Dermatitis due to Personal Protective Equipment Use and Hygiene Practices during the COVID-19 Pandemic: A Systematic Review of Case Reports

**Short Title:** Contact Dermatitis, PPE and COVID-19

## **Abstract**

**Background:** Prolonged use of personal protective equipment (PPE) may lead to contact dermatitis during the coronavirus disease 19 (COVID-19) pandemic. This paper aims to identify the causative factors of contact dermatitis from PPE and hygiene practices. **Methods:** The search was conducted adhering to PRISMA 2020 guidelines. A Delphi process was employed to ensure that the aims of this study were met. PubMed and Web of Science databases were systematically searched through September 12, 2021, using search terms: Contact dermatitis, case report, covid-19. The findings were tabulated as author/year, gender, age, presentation, cause, dermatological diagnosis, testing modality, provided treatment, symptom resolution (time in days), prognosis, and follow-up. **Results:** The mean age of all individuals was 29.75 years, with 75% females. All cases presented with erythema, with 62.5% reporting pruritus and 37.5% reporting burning facial symptoms. Surgical masks and hand-hygiene products (37.5%) were the most commonly reported causative agent with 25% due to KN95/FFP type 2 use. Allergic contact dermatitis (50%) and irritant contact dermatitis (25%) were common diagnoses. Treatments included creams, emollients, and desloratadine, with restriction of irritant-causing factors. The prognosis was generally good among the cases, with 62.5% presenting complete resolution within a week and 12.5% showing moderate improvement at the fourth month after discontinuing use. **Conclusion:** This study finds pertinent links between PPE use and contact dermatitis during the COVID-19 pandemic. While many cases are bound to go underreported in literature, well-designed, large-scale studies in the future may help promote these associations in a more comprehensive manner.

**Keywords:** Contact Dermatitis; Personal Protective Equipment; COVID-19

### *Manuscript*

## **Background**

Personal protective equipment (PPE), including face masks and hand sanitizers, is essential for safeguarding healthcare workers (HCWs) and general population members <sup>1</sup>. During the coronavirus disease 19 (COVID-19) pandemic, contact dermatitis was reported among HCWs across various observational studies <sup>23</sup>, in addition to single-patient reports. While allergic and irritant contact dermatitis is frequent, other skins lesions may occur <sup>4</sup>. A systematic review identifies that prolonged PPE use may lead to an increased risk of occupational dermatitis, which comprises allergic contact dermatitis (ACD) and irritant contact dermatitis (ICD). Another review identified that 80% of cases occurred due to ICD, with non-specific erythema and pressure contact urticaria <sup>5</sup>. This systematic review aims to identify the causes of contact dermatitis due to personal protective equipment use and hygiene practices by synthesizing cases reported in literature.

## **Methods**

This systematic review was conducted adhering to the PRISMA 2020 statement guidelines <sup>6</sup>. A Delphi process was employed to ensure that the study objectives were met <sup>7</sup>. A thorough systematic search was conducted across articles published in PubMed and Web of Science from December 2019 until September 12, 2021, with search terms (*Contact dermatitis, case report, covid-19*) listed in Table 1. A manual search was conducted across AMA (American Medical Association Journals), BMJ Case reports, ScienceDirect and Wiley.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Keywords used:</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Contact dermatitis:</b> "dermatitis, contact"[MeSH Terms] OR ("dermatitis"[All Fields] AND "contact"[All Fields]) OR "contact dermatitis"[All Fields] OR ("contact"[All Fields] AND "dermatitis"[All Fields])                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Case report:</b> "case reports"[Publication Type] or "case report"[All Fields]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Covid-19:</b> ("COVID-19" OR "COVID-19"[MeSH Terms] OR "COVID-19 Vaccines" OR "COVID-19 Vaccines"[MeSH Terms] OR "COVID-19 serotherapy" OR "COVID-19 serotherapy"[Supplementary Concept] OR "COVID-19 Nucleic Acid Testing" OR "covid-19 nucleic acid testing"[MeSH Terms] OR "COVID-19 Serological Testing" OR "covid-19 serological testing"[MeSH Terms] OR "COVID-19 Testing" OR "covid-19 testing"[MeSH Terms] OR "SARS-CoV-2" OR "sars-cov-2"[MeSH Terms] OR "Severe Acute Respiratory Syndrome Coronavirus 2" OR "NCOV" OR "2019 NCOV" OR (("coronavirus"[MeSH Terms] OR "coronavirus" OR "COV")) AND 2019/11/01[PDAT] : 3000/12/31[PDAT])) |

**Table 1.** Search terms employed.

Of the total 419 articles identified and post-removal of duplicates/tallying exclusion criteria, 15 full-text articles were analyzed. Seven were excluded as they were not case reports; contact dermatitis did not occur due to PPE use or hand hygiene measures. All of the eight articles that met the inclusion criteria were included in the final paper (Figure 1).

No funding was obtained for this systematic review and the authors perceived no conflicts of interest. This systematic review was registered with research registry unique identifying number (UIN) of “reviewregistry1270” in addition the overall AMSTAR 2 quality of this systematic review is **low**<sup>8</sup>.

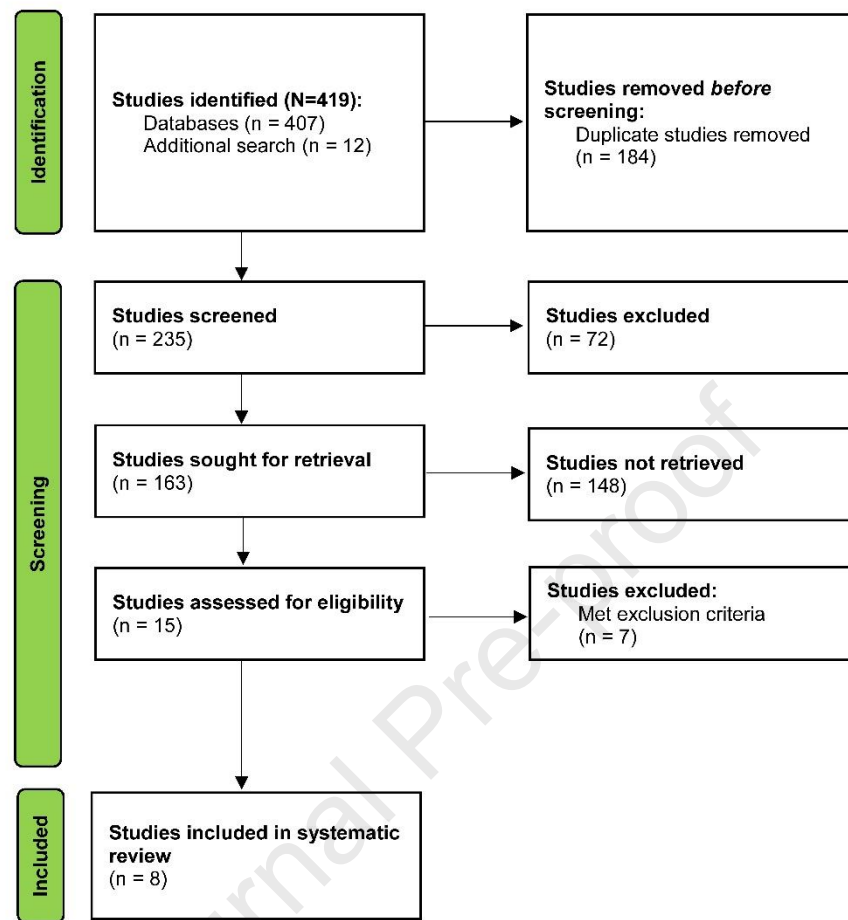


**Figure 1.** PRISMA flowchart.

## Results

A total of 8 case reports were included, classified by author/year, gender, age, presentation, cause, dermatological diagnosis, testing modality, provided treatment, symptom resolution (time in days), prognosis, and follow-up findings (Table 2). The mean age across all cases was 29.75 years, ranging from 3-64 years. There were 6 (75%) females. The common presentation among all cases was erythema (100%), with 5 (62.5%) patients who reported itching and 3 (37.5%) patients reporting burning facial symptoms. The causative factors were KN95/FFP type 2 masks among 2

(25%) cases, surgical masks for 3 (37.5%) individuals, and hand sanitizers/hand-hygiene indicators for 3 (37.5%) patients. The common diagnosis was ACD (50%), ICD (25%), contact urticaria (12.5%), frictional dermatitis (12.5%) and aquagenic urticaria (12.5%). Various treatments were administered, including creams, emollients, and desloratadine for ACD, with restriction of irritants for ICD. The prognosis was good among all reported cases after the intervention, with 5 (62.5%) resolved within 3-7 days, and no recurrence during the three months follow-up and 1 (12.5%) patient showing improvement at the fourth month for frictional dermatitis (Table 2).

| Author, Year                         | Gender | Age | Presentation                                                | Causative factor(s)                  | Diagnosis                                         | Testing                                                                              | Treatment                       | Symptom resolution (time in days) | Prognosis  | Follow-up                           |
|--------------------------------------|--------|-----|-------------------------------------------------------------|--------------------------------------|---------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------|-----------------------------------|------------|-------------------------------------|
| Xie et al., 2020 <sup>9</sup>        | Female | 23  | Facial symmetrical erythema; Itching                        | KN95                                 | Mask-induced allergic contact dermatitis (ACD)    | On D4, positive patch test reactions to TDI 2.0% pet. MDA 0.5% pet, and HDI 0.1% pet | Oral desloratadine              | 3                                 | Resolution | No recurrence at 3 months follow-up |
| Aerts et al., 2020 <sup>10</sup>     | Female | 38  | Burning facial and Periocular erythema; Itching             | Polypropylene surgical mask          | Occupational airborne allergic contact dermatitis | Positive patch test to formaldehyde 2% aq. on day 4                                  | NR                              | NR                                | NR         | NR                                  |
| O'Connell et al., 2020 <sup>11</sup> | Male   | 64  | Erythematous, eczematous patches; Itching                   | Hand-washing with standard dish soap | Irritant contact dermatitis                       | NR                                                                                   | OTC products; Cream; Emollients | 5                                 | Resolution | NR                                  |
| Klimek et al., 2020 <sup>12</sup>    | Female | 41  | Reddened, oozing, and later flaky skin rashes; Itchy        | FFP2 mask type                       | Mask-induced allergic contact dermatitis (ACD)    | NR                                                                                   | NR                              | NR                                | NR         | NR                                  |
| Corazza et al., 2021 <sup>13</sup>   | Female | 7   | Intermittent, erythematous rash, and facial swelling; Itchy | Polypropylene surgical mask          | Contact urticaria                                 | Negative patch test results; positive provocation test and a positive                | No treatment                    | NR                                | Resolution | NR                                  |

|                                  |        |    |                                                                   |                                                          |                                                                             |                                                                                                                                                                                                         |                                                                                      |    |             |                                                                           |
|----------------------------------|--------|----|-------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|----|-------------|---------------------------------------------------------------------------|
|                                  |        |    |                                                                   |                                                          |                                                                             | stop-restart test                                                                                                                                                                                       |                                                                                      |    |             |                                                                           |
| Alves et al., 2021 <sup>4</sup>  | Female | 22 | Pruriginous vesicular erythema                                    | Rubber domestic gloves and latex gloves, and various PPE | Aquagenic urticaria (AU) and Mask-induced allergic contact dermatitis (ACD) | Positive water provocation test (histamine – 5 mm; diluent – 0 mm); Positive patch test [day (D)4, positive reactions were observed to 2-mercaptobenzo thiazole (MBT) (+++) and 1% cobalt chloride (+)] | Topical emollients and corticosteroids, and Ebastine 20 mg twice daily for urticaria | NR | Resolution  | NR                                                                        |
| Panda et al., 2021 <sup>14</sup> | Male   | 3  | Palmar erythema                                                   | Alcohol-based hand sanitizer                             | Irritant contact dermatitis (ICD)                                           | None conducted                                                                                                                                                                                          | No treatment; restriction of hand sanitizer user                                     | 7  | Resolution  | Complete remittance at one-week follow-up                                 |
| Sinha et al., 2021 <sup>15</sup> | Female | 40 | Confluent depigmentation, skin lesions; Burning facial sensations | Surgical masks                                           | Frictional dermatitis                                                       | Patch tests on day (D)2 and D4, the semi-open tests with the mask pieces were left in situ for 96 hours and read on D4 and D5,                                                                          | Tacrolimus daily                                                                     | 84 | Improvement | After 12 weeks, the depigmented macules showed significant repigmentation |

**Table 2.** Characteristics of included case reports.

## Discussion

To the best of our knowledge, this is the first systematic review of case reports to collate evidence of dermatitis due to PPE use during the COVID-19 pandemic. The first case of mask-induced ACD due to polyurethane was reported in 2020 used in the production of PPE products, including for the sponge strip inside the mask which, may lead to the reaction of diisocyanates causing ACD or precipitate asthma attacks <sup>9</sup>. While polyurethanes are fully cured polymers and are not believed to be sensitizers, the residual cross-linkers are reported to lead to allergic reactions that may be responsible for a myriad of respiratory symptoms, in addition to ACD <sup>9</sup>. The prolonged use of facial masks and skin problems such as irritant contact dermatitis is not uncommon, with reports of various facial skin problems during the previous severe acute respiratory syndrome (SARS) epidemic <sup>10</sup>. Formaldehyde is a frequent contact sensitizer or irritant.

Given that patients, healthcare workers, and the general population are required to wear polypropylene surgical masks, more ACD and ICD are likely to occur in and outside the workplace <sup>10</sup>. Furthermore, filtering half masks of the FFP2 classification is one of the most frequently used healthcare PPE items <sup>12</sup>. The FFP2 masks can trigger contact dermatitis, an inflammatory, non-infectious, intolerant skin reaction induced by chemical, immunological or physical toxins <sup>12</sup>.

The current literature suggests that the continuous use of surgical masks among healthcare workers and general population members may cause ACD or ICD, contact urticaria, and exacerbation of acne and skin infections <sup>13</sup>. The causal agents in these scenarios may be flavorings, fragrances, preservatives, medications, and disinfectants <sup>13</sup>. During the COVID-19 pandemic, the high prevalence of occupational dermatoses has been noted in a Chinese cohort of healthcare workers where 74% of respondents reported adverse skin reactions due to hand hygiene practices and PPE use <sup>4</sup>. Reports of a new form of irritant rhinitis to FFP masks (FFP2/N95/KN95) during the

COVID-19 pandemic may also be found <sup>16</sup>. Our findings highlight the broad occupational dermatosis of single patients and create awareness of the impact that common or rare skin conditions like aquagenic urticaria may have on occupational impact <sup>4</sup>. The risks of ICD have been increased mainly due to overzealous hand hygiene with sanitizers, leading to prolonged exposure of physical or chemical agents, as identified in our study results <sup>14</sup>. Such over-rigorous hand hygiene practices may lead to impairment of keratocytes, disruption of the epidermal barrier, the release of pro-inflammatory cytokines, and delayed-type hypersensitivity reactions, due to activation of the skin's immune system <sup>14</sup>. As opposed to hand sanitizers and gloves, wearing surgical or other masks as a cause of skin lesions and irritation has been less reported during the COVID-19 pandemic <sup>15</sup>. However, N95 (FF2) masks may lead to increased skin reactions due to constant friction and moisture due to the tighter fit and higher impermeability, compared to surgical masks alone <sup>15</sup>. Our study indicates that depigmentation, presenting as contact leukoderma or vitiligo following koebnerization due to frictional dermatitis, maybe a rare consequence of mask usage <sup>15</sup>.

There are certain limitations to this systematic review that must be acknowledged. First, the search was limited to two databases (PubMed and Web of Science), impacting the search process. Published literature, including only case reports, was considered. The results of this study may not be fully generalizable but represent a noteworthy overview in the area of contact dermatitis related to PPE and COVID-19, serving as a cautionary reminder to health authorities that safety for populations must be a top priority.

## **Conclusion**

This systematic review describes the links of PPE use and contact dermatitis during the COVID-19 pandemic among eight cases. Given that healthcare workers and the general public must wear

face masks and practice hand hygiene more often than before, such incidences of contact dermatitis are not uncommon. Well-designed, higher-powered studies are required in this area to ensure that a better understanding of PPE and contact dermatitis is seen. More comprehension of the reasons for such dermatological reactions may be made by mitigating unawareness of irritant PPE materials using awareness-increasing platforms. With diligent hand disinfection reinforced during COVID-19, the increased prevalence of contact dermatitis is documented but our systematic review highlights the fact that the condition is readily treatable and ought not to cause any deviation from proper hand hygiene and PPE use.

#### **Provenance and peer review:**

Not commissioned, externally peer reviewed.

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**Conflicts of Interest:** None.

**Funding Declaration:** None obtained.

1. Prolonged PPE use for COVID-19 makes users vulnerable to contact dermatitis
2. Irritant and contact dermatitis due to surgical masks/KN95/FFP type 2/ hygiene products was reported
3. Treatments include creams, emollients, desloratadine and avoidance of irritants

## Annals of Medicine and Surgery

The following information is required for submission. Please note that failure to respond to these questions/statements will mean your submission will be returned. If you have nothing to declare in any of these categories then this should be stated.

### Please state any conflicts of interest

All authors must disclose any financial and personal relationships with other people or organisations that could inappropriately influence (bias) their work. Examples of potential conflicts of interest include employment, consultancies, stock ownership, honoraria, paid expert testimony, patent applications/registrations, and grants or other funding.

None declared.

### Please state any sources of funding for your research

All sources of funding should be declared as an acknowledgement at the end of the text. Authors should declare the role of study sponsors, if any, in the collection, analysis and interpretation of data; in the writing of the manuscript; and in the decision to submit the manuscript for publication. If the study sponsors had no such involvement, the authors should so state.

None obtained.

### Ethical Approval

Research studies involving patients require ethical approval. Please state whether approval has been given, name the relevant ethics committee and the state the reference number for their judgement.

None required.

**Consent**

Studies on patients or volunteers require ethics committee approval and fully informed written consent which should be documented in the paper.

Authors must obtain written and signed consent to publish a case report from the patient (or, where applicable, the patient's guardian or next of kin) prior to submission. We ask Authors to confirm as part of the submission process that such consent has been obtained, and the manuscript must include a statement to this effect in a consent section at the end of the manuscript, as follows: "Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request".

Patients have a right to privacy. Patients' and volunteers' names, initials, or hospital numbers should not be used. Images of patients or volunteers should not be used unless the information is essential for scientific purposes and explicit permission has been given as part of the consent. If such consent is made subject to any conditions, the Editor in Chief must be made aware of all such conditions.

Even where consent has been given, identifying details should be omitted if they are not essential. If identifying characteristics are altered to protect anonymity, such as in genetic pedigrees, authors should provide assurance that alterations do not distort scientific meaning and editors should so note.

Not applicable.

**Author contribution**

Please specify the contribution of each author to the paper, e.g. study concept or design, data collection, data analysis or interpretation, writing the paper, others, who have contributed in other ways should be listed as contributors.

All authors have contributed equally to the conception, data collection, analysis and review of the paper.

### Registration of Research Studies

In accordance with the Declaration of Helsinki 2013, all research involving human participants has to be registered in a publicly accessible database. Please enter the name of the registry and the unique identifying number (UIN) of your study.

You can register any type of research at <http://www.researchregistry.com> to obtain your UIN if you have not already registered. This is mandatory for human studies only. Trials and certain observational research can also be registered elsewhere such as: [ClinicalTrials.gov](http://ClinicalTrials.gov) or ISRCTN or numerous other registries.

1. Name of the registry: Not Applicable.
2. Unique Identifying number or registration ID: Not Applicable.
3. Hyperlink to your specific registration (must be publicly accessible and will be checked): Not Applicable.

### Guarantor

The Guarantor is the one or more people who accept full responsibility for the work and/or the conduct of the study, had access to the data, and controlled the decision to publish

Ivan Cherrez-Ojeda and Zouina Sarfraz are co-guarantors of the study.



## PRISMA 2020 Checklist

| Section and Topic             | Item # | Checklist item                                                                                                                                                                                                                                                                                       | Location where item is reported |
|-------------------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| <b>TITLE</b>                  |        |                                                                                                                                                                                                                                                                                                      |                                 |
| Title                         | 1      | Identify the report as a systematic review.                                                                                                                                                                                                                                                          | Title page                      |
| <b>ABSTRACT</b>               |        |                                                                                                                                                                                                                                                                                                      |                                 |
| Abstract                      | 2      | See the PRISMA 2020 for Abstracts checklist.                                                                                                                                                                                                                                                         | Page 2                          |
| <b>INTRODUCTION</b>           |        |                                                                                                                                                                                                                                                                                                      |                                 |
| Rationale                     | 3      | Describe the rationale for the review in the context of existing knowledge.                                                                                                                                                                                                                          | Page 3                          |
| Objectives                    | 4      | Provide an explicit statement of the objective(s) or question(s) the review addresses.                                                                                                                                                                                                               | Page 3                          |
| <b>METHODS</b>                |        |                                                                                                                                                                                                                                                                                                      |                                 |
| Eligibility criteria          | 5      | Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.                                                                                                                                                                                          | Page 2-4                        |
| Information sources           | 6      | Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.                                                                                            |                                 |
| Search strategy               | 7      | Present the full search strategies for all databases, registers and websites, including any filters and limits used.                                                                                                                                                                                 |                                 |
| Selection process             | 8      | Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.                     |                                 |
| Data collection process       | 9      | Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process. |                                 |
| Data items                    | 10a    | List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.                        |                                 |
|                               | 10b    | List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.                                                                                         |                                 |
| Study risk of bias assessment | 11     | Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.                                    |                                 |
| Effect measures               | 12     | Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.                                                                                                                                                                  |                                 |
| Synthesis methods             | 13a    | Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).                                                                                 |                                 |
|                               | 13b    | Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.                                                                                                                                                |                                 |
|                               | 13c    | Describe any methods used to tabulate or visually display results of individual studies and syntheses.                                                                                                                                                                                               |                                 |
|                               | 13d    | Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.                                          |                                 |
|                               | 13e    | Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).                                                                                                                                                                 |                                 |
|                               | 13f    | Describe any sensitivity analyses conducted to assess robustness of the synthesized results.                                                                                                                                                                                                         |                                 |
| Reporting bias assessment     | 14     | Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).                                                                                                                                                                              |                                 |
| Certainty assessment          | 15     | Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.                                                                                                                                                                                                |                                 |



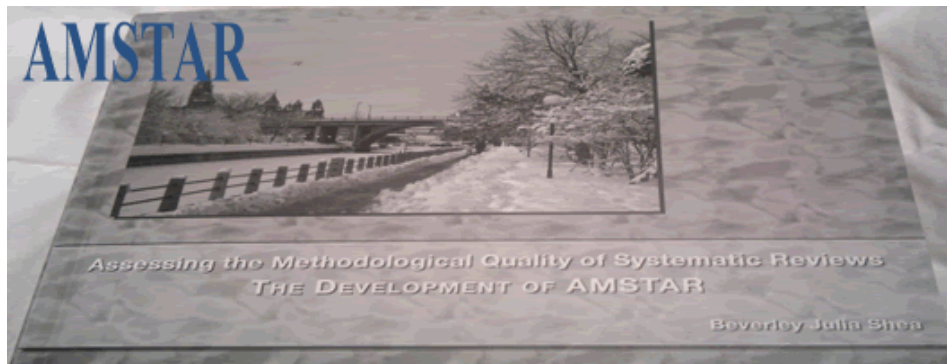
## PRISMA 2020 Checklist

| Section and Topic                              | Item # | Checklist item                                                                                                                                                                                                                                                                       | Location where item is reported                                           |
|------------------------------------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| RESULTS                                        |        |                                                                                                                                                                                                                                                                                      |                                                                           |
| Study selection                                | 16a    | Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.                                                                                         | Page 3-7                                                                  |
|                                                | 16b    | Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.                                                                                                                                                          |                                                                           |
| Study characteristics                          | 17     | Cite each included study and present its characteristics.                                                                                                                                                                                                                            |                                                                           |
| Risk of bias in studies                        | 18     | Present assessments of risk of bias for each included study.                                                                                                                                                                                                                         |                                                                           |
| Results of individual studies                  | 19     | For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.                                                     |                                                                           |
| Results of syntheses                           | 20a    | For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.                                                                                                                                                                               |                                                                           |
|                                                | 20b    | Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect. |                                                                           |
|                                                | 20c    | Present results of all investigations of possible causes of heterogeneity among study results.                                                                                                                                                                                       |                                                                           |
|                                                | 20d    | Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.                                                                                                                                                                           |                                                                           |
| Reporting biases                               | 21     | Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.                                                                                                                                                              |                                                                           |
| Certainty of evidence                          | 22     | Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.                                                                                                                                                                                  |                                                                           |
| DISCUSSION                                     |        |                                                                                                                                                                                                                                                                                      |                                                                           |
| Discussion                                     | 23a    | Provide a general interpretation of the results in the context of other evidence.                                                                                                                                                                                                    | Page 8-9                                                                  |
|                                                | 23b    | Discuss any limitations of the evidence included in the review.                                                                                                                                                                                                                      |                                                                           |
|                                                | 23c    | Discuss any limitations of the review processes used.                                                                                                                                                                                                                                |                                                                           |
|                                                | 23d    | Discuss implications of the results for practice, policy, and future research.                                                                                                                                                                                                       |                                                                           |
| OTHER INFORMATION                              |        |                                                                                                                                                                                                                                                                                      |                                                                           |
| Registration and protocol                      | 24a    | Provide registration information for the review, including register name and registration number, or state that the review was not registered.                                                                                                                                       | research registry unique identifying number (UIN) of “reviewregistry1270” |
|                                                | 24b    | Indicate where the review protocol can be accessed, or state that a protocol was not prepared.                                                                                                                                                                                       |                                                                           |
|                                                | 24c    | Describe and explain any amendments to information provided at registration or in the protocol.                                                                                                                                                                                      |                                                                           |
| Support                                        | 25     | Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.                                                                                                                                                        | NA                                                                        |
| Competing interests                            | 26     | Declare any competing interests of review authors.                                                                                                                                                                                                                                   | NA                                                                        |
| Availability of data, code and other materials | 27     | Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.                                           | NA                                                                        |



## PRISMA 2020 Checklist

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## AMSTAR 2 Results

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**Article Name:**

### Contact Dermatitis due to PPE Use and Hygiene Practices is a Low quality review

|                                                                                                                                                                                                                           |                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| <b>1. Did the research questions and inclusion criteria for the review include the components of PICO?</b>                                                                                                                | Yes<br>Yes<br>Yes<br>Yes<br>Yes<br>Yes                           |
| <b>2. Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?</b> | YesPartial<br>YesYesYesYes                                       |
| <b>3. Did the review authors explain their selection of the study designs for inclusion in the review?</b>                                                                                                                | Yes<br><br>Yes                                                   |
| <b>4. Did the review authors use a comprehensive literature search strategy?</b>                                                                                                                                          | Yes<br>Partial Yes<br>Yes<br>Yes<br>Yes<br>Yes<br><br>Yes<br>Yes |
| <b>5. Did the review authors perform study selection in duplicate?</b>                                                                                                                                                    | Yes<br>Yes                                                       |
| <b>6. Did the review authors perform data extraction in duplicate?</b>                                                                                                                                                    | Yes<br>Yes                                                       |

|                                                                                                                                                                                                                   |                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| <b>7. Did the review authors provide a list of excluded studies and justify the exclusions?</b>                                                                                                                   | Yes<br>Yes<br>Yes                                                  |
| <b>8. Did the review authors describe the included studies in adequate detail?</b>                                                                                                                                | Yes<br>Yes<br>Yes<br>Yes<br>Yes<br>Yes<br>Yes<br>Yes<br>Yes<br>Yes |
| <b>9. Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?</b><br>RCT                                                 | No                                                                 |
| <b>NRSI</b>                                                                                                                                                                                                       | Partial Yes                                                        |
|                                                                                                                                                                                                                   | Yes<br>Yes                                                         |
| <b>10. Did the review authors report on the sources of funding for the studies included in the review?</b>                                                                                                        | Yes<br>Yes                                                         |
| <b>11. If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?</b><br>RCT                                                                           | 0                                                                  |
| <b>NRSI</b>                                                                                                                                                                                                       | 0                                                                  |
| <b>12. If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?</b>                       | 0                                                                  |
| <b>13. Did the review authors account for RoB in individual studies when interpreting/ discussing the results of the review?</b>                                                                                  | Yes<br>Yes                                                         |
| <b>14. Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?</b>                                                             | Yes<br>Yes                                                         |
| <b>15. If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?</b> | 0                                                                  |

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|                                                                                                                                                        |     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>16. Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?</b> | Yes |
|                                                                                                                                                        | Yes |

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To cite this tool: Shea BJ, Reeves BC, Wells G, Thuku M, Hamel C, Moran J, Moher D, Tugwell P, Welch V, Kristjansson E, Henry DA. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. BMJ. 2017 Sep 21;358:j4008.

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