Narrative review

Evidence from Cochrane systematic reviews for the dissemination control of the COVID-19 infection

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ABSTRACT

Introduction: The COVID-19 infection has high transmissibility and several measures have been adopted for dissemination control. **Objective:** To identify and summarize the evidence from the Cochrane systematic reviews (SR) on measures to control the dissemination of the COVID-19 infection. Study design: This review of Cochrane SR has carried out in the Division of Vascular and Endovascular Surgery and in the Division of Emergency Medicine and Evidence-Based Medicine of the Universidade Federal de São Paulo, Brazil. **Methods:** A comprehensive search in the Cochrane Database of Systematic Reviews retrieved all Cochrane SR directly related to control measures for the COVID-19 dissemination. The main characteristics and results of all included SR were summarized and discussed. **Results:** Three Cochrane SRs were included in the qualitative synthesis and they evaluated populational and individual measures to control the dissemination of COVID-19. **Conclusion:** Low-certainty evidence show that quarantine of people exposed to those confirmed or suspected COVID-19 cases prevented 44% - 81% of incident cases and 31% - 63% of deaths compared to no measures and as sooner the quarantine measures are implemented, greater costs are saved. High-confidence evidence showed that clear communication about infection control and prevention guidelines was vital to its implementation. Low-certainty evidence showed that people with a long gown had less contamination than those with a coverall, and the coverall was more difficult to doff. Other SRs are desirable for controlling the dissemination of the COVID-19 infection.

KEY WORDS: Coronavirus infections, coronavirus, review, evidence-based practice, pandemics

INTRODUCTION

The disease reached by Coronavirus 2019 (COVID-19) is a respiratory tract infection caused by a new coronavirus, which was first identified in Wuhan, China, in December 2019. While many people with COVID-19 develop only moderate symptoms or infection without complications, approximately 14% develop a severe disease that requires hospitalization and oxygen support, and 5% require admission to an intensive care unit. This virus disseminates among people mainly through the respiratory route, coughing and sneezing, but it can also be transmitted through contaminated surfaces. Although the incubation time varies from 5 to 6 days in the major of cases, this time can reach up to 14 days. The infection period is not precise, varying from 24 hours to 48 hours before the manifestation of the symptoms, with a high amount of viruses detected in the upper respiratory tract in the onset of the disease.1

When a new respiratory infection becomes widespread, such as the COVID-19 pandemic, health professionals must adhere to protocols in order to avoid contamination and infection. The strategies of these protocols include the use of personal protective equipment (PPE) such as masks, face protection, gloves, gowns; isolation of patients with a respiratory infection and strict cleaning routine. As, in practice, these strategies can be challenging to adhere to, the health care authorities and facilitators need to support health professionals to implement them.2

In epidemics and pandemics with highly infectious diseases such as severe acute respiratory syndrome (SARS), Ebola and COVID-19, health professionals are the group with the highest risk of infection due to contact with body fluids of contaminated patients.3

The World Health Organization (WHO) recommends quarantine (isolated and associated with other public health measures) as a measure to control the spread of infection. Both quarantine and social isolation are epidemiological interventions to mitigate infectious disease and reduce the potential for transmission. However, the effects of these and other measures to control the pandemic still generate discussions.4

Different countries use interventions for the infection dissemination control, both individual and collective, such as the use of PPE, social isolation and compulsory quarantine, but the impact of such measures still requires studies that bring robust evidence.

OBJECTIVE

This study aimed to identify and summarize the pieces of evidence from the Cochrane systematic reviews (SR) regarding measures to control the COVID-19 infection dissemination in an overview.

METHODS

Design and setting

This review of the Cochrane SR has carried out in the Division of Vascular and Endovascular Surgery and the Division of Emergency Medicine and Evidence-Based Medicine of the Universidade Federal de São Paulo, Brazil.

Inclusion criteria

Types of study

Full Cochrane SRs published in the Cochrane Database of Systematic Reviews (CDSR) were included, with no restrictions on the date of publication. Withdrawn or outdated versions of SR and protocols for SR were considered not relevant.

Types of participants

All participants at risk of contagion, with suspected clinical status or confirmed COVID-19 infection, male and female, of all ages, with no restrictions as to the severity of the condition or place of treatment (outpatient or hospital) were considered relevant.

Types of interventions

We considered the SRs that evaluated any intervention to control the spread or reduce contagion of COVID-19 infection compared to standard care or another intervention, in at least one arm of the study.

Types of outcomes

Any epidemiological, clinical or laboratory results relevant to the patient were considered, as assessed by the authors of the included SR.

Revision search

We performed a sensitive systematic search on the CDSR, via Wiley, on 26 April 2020. We used the following MeSH terms 'Coronavirus Infections' and 'Coronavirus', all related variants, in addition to free terms in 'titles, abstracts and keywords'. The detailed electronic search strategy is shown in **Table 1**.

Revision selection

Two researchers (RLGF and LCUN) independently assessed the titles and abstracts to analyse whether the SR met the inclusion criteria using the Rayyan software (rayyan.qcri.org/welcome).[5] Any disagreement was resolved with the consultation of other authors (PIFP and CDQF) or by discussion. The SR were selected and summarized by two authors (RLGF, PIFP).

Results presentation

The search results and the SRs included were presented as a qualitative synthesis (descriptive approach).

RESULTS

Search Results

Our search strategy retrieved 19 references and, after screening the titles and abstracts, six SRs were pre-selected. After evaluating the full texts, three reviews met the inclusion criteria and were included in the qualitative summary.[2-4]

Comments included

The most recent versions of all included SRs were published in April 2020 in the CDSR. Details regarding the review design, the characteristics of the interventions, comparisons, results and the certainty or confidence of evidence are presented in **Table 2**.[2-4]

1. Quarantine alone or in combination with other public health measures to control COVID-19: a rapid review [4]

A rapid review was carried out to support WHO quarantine-related measures since the COVID-19 pandemic was declared in March 2020. Nussbaumer-Streit et al. performed a SR with abbreviated methods (rapid review) in order to evaluate two key questions (KQ): 1) the effects of quarantine (isolated and when associated with other public health measures) of individuals who had contact with confirmed cases of COVID -19 and 2) the effects of quarantine on individuals who have travelled from countries with a declared pandemic or who live in regions with high transmission of the disease.

Main results

The SR authors included 29 studies: 10 modelling studies at COVID-19, four observational studies and 15 modelling studies at SARS and the Middle East respiratory syndrome (MERS) (**Table 2**). Due to the different measurement and analysis methods among the results of interest, it was not possible to carry out a meta-analysis, and the SR authors summarized the data in a narrative synthesis. Following the Grading of Recommendations, Assessment, Development and Evaluations (GRADE) approach, the level of evidence varied from low to very low due to the type of evidence found for this SR. [6]

Modelling studies reported a benefit from simulated quarantine measures, for instance, quarantining people exposed to confirmed or suspected cases prevented 44% to 81% of incident cases and 31% to 63% of deaths compared to no measures and based in different settings (incident cases: four modelling studies in COVID-19, in SARS; mortality: two modelling studies in COVID-19, in SARS, low-certainty evidence). Low-certainty evidence suggests that the earlier the quarantine measures are implemented, the higher costs are saved (two modelling studies on SARS). Low-certainty evidence indicates that the effect of quarantining travellers from a country with a reported outbreak was small in reducing the incidence of the disease and deaths (two modelling studies on SARS). When the models' combined quarantine with other prevention and control measures, including school closures, travel restrictions and social distance, modelling studies showed a more significant effect in reducing new cases, transmissions and deaths than in individual measures alone (cases incidents: four modelling studies at COVID-19; subsequent transmission: two modelling studies at COVID-19; mortality: two modelling studies at COVID-19; low-certainty evidence). The studies on SARS and MERS were consistent with the results of studies on COVID-19.

Adverse effects

This SR focused on transmission, reducing mortality and the use of quarantine resources because WHO selected these as outcomes of interest. The SR authors did not include the psychological impact of quarantine on individuals. There may be other adverse economic and health effects resulting from quarantine that were not assessed by this review (for example, quality of life, unemployment and domestic violence). For these reasons, this SR was unable to address the issue of when quarantine and other public health measures aimed at reducing the spread of COVID-19 should be relaxed or limited. It is also important to note that the SR authors did not submit the two modelling studies that report the use of resources to specific critical assessments for economic assessments and did not attempt to conclude the relative costs or quarantine efficiency alone or in combination with other measures compared to these isolated public health interventions or measures.

Review conclusions

This SR showed that quarantine is essential in reducing incidence and mortality during the COVID-19 pandemic, but the evidence is limited to modelling studies that make assumptions of parameters based on current knowledge. The early implementation of the quarantine and the combination of the quarantine with other public health measures proved to be essential to ensure effectiveness. Decision-makers should continuously monitor the outbreak situation and the impact of the measures implemented. Testing representative samples in different contexts can help to assess the true prevalence of infection and reduce the uncertainty of modelling assumptions.

2. Barriers and facilitators to healthcare workers' adherence with infection prevention and control (IPC) guidelines for respiratory infectious diseases: a rapid qualitative evidence synthesis [2]

It is a rapid review for the evidence synthesis on the factors that influence health professionals to follow infection control and prevention (ICP) protocols for respiratory diseases. These strategies include the use of PPE such as masks, face shields, gloves and an apron; isolation of patients with infectious respiratory disease; and stricter cleaning routine. The review authors searched only the MEDLINE database via OVID and included all types of primary studies, with no limits on date or language of publication. The review authors used the GRADE-CERQual approach (Trust in Evidence from Qualitative Research Reviews) to assess confidence in each result.

Main results

The SR authors found 36 relevant studies and 20 studies were included in the qualitative analysis of this review. There was no meta-analysis, and the results were reported narratively (Table 2). Ten of the included studies were from Asia, four from Africa, four from Central America and North America and two from Australia. The studies demonstrated the vision and experience of nurses, doctors and other health professionals who deal with SARS, Influenza A (H1N1), MERS, tuberculosis (TB) or seasonal influenza. Most participating health professionals work in hospitals and primary care communities.

The following factors (barriers or facilitators) are based on results assessed as moderate to high confidence.

Health professionals felt insecure about how to follow local guidelines when they were long and ambiguous or did not reflect national or international guidelines. They felt overwhelmed because local guidelines were continually changing. They also described how ICP strategies led to increased workloads and fatigue, for example, because they had to wear PPE and do additional cleaning. Health professionals described how the level of support they felt they received from their management team influenced their responses to ICP guidelines.

Clear communication about ICP guidelines was considered vital. Health professionals pointed out the lack of training on the infection itself and on how to use PPE and also considered it to be a problem when training was not mandatory.

Sufficient space to isolate patients was also considered essential. The lack of isolation rooms, antechambers and showers was a problem. Other critical practical measures described by health professionals include minimizing overcrowding, rapid screening of infected patients, restricting visitors and easy access to handwashing facilities.

The lack of PPE and inadequate quality equipment was a serious concern for health workers and managers. They also pointed out the need to adjust the volume of supplies as outbreaks of infection continued.

Health professionals believed that they followed ICP guidelines more carefully when they understood their value. Some health professionals felt motivated to follow the guidelines because they were afraid of infecting themselves or their families or because they felt responsible for their patients. Some health professionals found it difficult to use masks and other equipment when it made patients feel isolated, scared or stigmatized. Health professionals also found masks and other equipment uncomfortable to use. The culture of the workplace can also influence whether health professionals follow ICP guidelines or not.

In many of the conclusions, health professionals pointed out the importance of including all employees, including cleaning, doorkeepers, kitchen and other support staff when implementing ICP guidelines.

Adverse effects

Some factors may constitute barriers to infection control and prevention strategies, such as the lack of alignment of national and international protocols, leading to the insecurity of health professionals in following them. Another critical factor is the lack of personal protective equipment or the availability of inferior material, causing discomfort among professionals. In some situations, although health professionals have access to regulations, it can be challenging to adhere to the protocols, especially when working in critical conditions.

Review conclusions

The review authors point out several factors that influenced the ability and willingness of health professionals to follow ICP guidelines when managing respiratory diseases. Those factors include factors linked to the guideline itself and how it is communicated, support from managers, the culture of the workplace, training, physical space, access and confidence in personal protective equipment and the desire to provide excellent patient care. The review also highlights the

importance of including all staff at the facility, including the support team, when implementing the ICP guidelines.

3. Personal protective equipment for preventing highly infectious diseases due to exposure to contaminated body fluids in healthcare staff [3]

In situations of the outbreak of epidemics or pandemics, there is an increased risk of infection for healthcare professionals due to greater exposure to body fluids from infected patients and PPE can reduce this exposure. This study is a systematic review to assess which type of full-body PPE and which method of dressing and undressing has the lowest risk of contamination and infection for health professionals, in addition to training methods that can increase adherence to protocols.

Main results

The SR authors included 24 studies with 2,278 participants in this SR, 14 of these studies were randomized controlled trials (RCT), one quasi-RCT and nine had a non-randomized design. From those 24 included studies, eight compared types of PPE, six studies evaluated adapted PPE, eight compared dressing and undressing processes, and three studies evaluated types of training. Eighteen studies used simulated exposure with fluorescent markers or harmless microbes. In simulation studies, the average contamination rates were 25% for the intervention and 67% for the control groups.

The certainty of the evidence for all results is very low, except when mentioned otherwise, because it is based on one or two studies, because it used indirect evidence in the simulation studies and because of the risk of bias in the included studies (Table 2).

The use of an energized respirator and air purifier with coveralls can protect against the risk of contamination better than an N95 mask and gown (relative risk (RR) 0.27, 95% confidence interval (CI) 0.17 to 0.43), but it was more difficult to wear (non-conformity: RR 7.5, 95% CI 1.81 to 31.1). In an RCT (59 participants), people with a long gown had less contamination than those with overalls, and the overalls were more difficult to wear (evidence of low certainty). Long aprons (gown) can better protect against contamination than short aprons (small spots: mean difference (MD) -10.28, 95% CI -14.77 to -5.79). PPE made of more breathable material can lead to a similar number of stains on the trunk (MD 1.60, 95% CI -0.15 to 3.35) compared to water-repellent material, but can have greater user satisfaction (MD -0.46, 95% CI -0.84 to -0.08, scale from 1 to 5).

The following modifications to the design of the PPE can lead to less contamination compared to the standard PPE: the combination of sealed gown and gloves (RR 0.27, 95% CI 0.09 to 0.78), a more suitable dress around the neck, wrists and hands (RR 0.08, 95% CI 0.01 to 0.55), better coverage of the dress-wrist interface (RR 0.45, 95% CI 0.26 to 0.78, evidence of low certainty), additional guides to grab to facilitate the use of masks (RR 0.33, 95% CI 0.14 0.80) or gloves (RR 0.22, 95% CI 0.15 to 0.31).

The use of the Centers for Disease Control and Prevention (CDC) recommendations can lead to less contamination compared to no guidance (small spots: MD -5.44, 95% CI -7.43 to -3.45). One-step removal of gloves and gown can lead to less bacterial contamination (RR 0.20, 95% CI 0.05 to 0.77), but not less fluorescent contamination (RR 0.98, 95% CI 0.75 to 1.28) than separate removal.

The use of double gloves can lead to less viral or bacterial contamination compared to simple gloves (RR 0.34, 95% CI 0.17 to 0.66), but not less fluorescent contamination (RR 0.98, CI 95 % 0.75 to 1.28). Additional spoken instruction can lead to fewer errors in execution (MD -0.9, 95% CI -1.4 to -0.4) and fewer points of contamination (MD -5, 95% CI -8.08 to - 1.92).

The use of additional computer simulation can lead to fewer errors in the process (MD -1.2, 95% CI -1.6 to -0.7). A video lecture on PPE placement can lead to better skill scores (MD 30.70, 95% CI 20.14 to 41.26) than a traditional lecture. Face-to-face instructions can reduce non-compliance with guidelines compared to just providing folders or videos (odds ratio (OR) 0.45, 95% CI 0.21 to 0.98).

Adverse effects

The use of various elements of PPE creates discomfort in its use, which can increase the risk of contamination of the health professional at the time of undressing.

The use of an energized respirator and air purifier with overalls was more challenging to wear (non-compliance: RR 7.5, 95% CI 1.81 to 31.1).

Review conclusions

This SR found low to very low-certainty evidence that covering more parts of the body leads to better protection, but it is generally more difficult to wear or make and generates less user comfort and, therefore, may even lead to more contamination. More breathable types of PPE can lead to similar contamination but can have greater user satisfaction. Modifications to the design of the PPE, such as gripping guides, can decrease the risk of contamination. For placement and manufacturing procedures, following the CDC guidelines, removing the glove and gown in one step, double gloves, verbal instructions during execution and the disinfection of gloves can reduce contamination and increase compliance. Face-to-face training in the use of PPE can reduce errors more than training based on printed material such as folders.

The SR authors conclude that we still need training RCTs with long-term follow-up, simulation studies with more participants to find out which PPE combinations and which procedure better protects. There is an urgent need for a consensus on the simulation of exposure and evaluation of the result. They also concluded that we need more evidence from real life. Therefore, the use of PPE by health professionals exposed to highly infectious diseases must be registered, and the health professional must be followed prospectively regarding the risk of infection.

DISCUSSION

The COVID-19 pandemic is right now the most significant global health threat, and its dissemination has been rapid, with at least 146 countries affected.[7]

One of the WHO guidelines for disease control is quarantine, which means the separation between healthy people who can be infected by the virus and have the potential to spread the disease. Another similar recommendation is isolation (similar to quarantine, but it includes people with symptoms of COVID-19) and social distance (when healthy people keep physical distance from other people) .[1]

In massive pandemics with a highly infectious disease such as COVID-19, there is higher contamination among health professionals, who may develop earlier infectious conditions, due to more significant contact with infected people. Therefore, it is urgent to determine strategies and include protocols for these professionals so that there is greater adherence to these regulations. When using personal protective equipment such as masks, glasses, face shield, gloves, aprons and coveralls as a routine in the care of these infected patients and following the guidelines for dressing and undressing, there will be more significant mitigation in cases of contamination. Often, these strategies become difficult to follow in practice, so there is a need for more significant support for these professionals for them to be implemented.

Several measures were taken in the face of this pandemic, such as the combination of case isolation, domestic quarantine and social distance between risk groups (the elderly, individuals with comorbidities) which is the most effective combined policy for reducing the epidemic curve.

Through these Cochrane SRs, it is possible to identify the effects of the strategies used to clarify health professionals regarding the use of PPE and the valuation of its use. When following the care protocols to avoid contamination, there is greater security for this professional. Also, it is possible to determine the effects of quarantine (isolated and when associated with other public health measures) to reduce incidence and mortality during the COVID-19 pandemic and that its early implementation is essential for the effectiveness of this action.

The success of those approaches is not only due to the effectiveness of their implementation, but mainly due to the natural and biological history of the pathogen in question, its transmissibility and the feasibility of the intervention in the context of the country's public health.[8]

The number of Cochrane systematic reviews that directly address the COVID-19 pandemic is still limited, but efforts are being made to rapidly produce high-quality syntheses of evidence that are of interest for decision-makers in health and health policy.[9]

CONCLUSION

After a systematic search, three Cochrane SRs were included and contributed with evidence on population measures (such as quarantine and isolation) and individual measures (such as the use of PPE, type of PPE, etc.) to control the spread and manage infection by COVID-19.

Low-certainty evidence shows that quarantine of people exposed to confirmed or suspected cases prevented 44% - 81% of incident cases and 31% - 63% of deaths compared to no measure, and earlier the quarantine measures are implemented, higher are the savings of costs.

Evidence of high confidence showed that clear communication about ICP guidelines was considered vital to its implementation. Also, evidence of moderate confidence showed that health professionals felt insecure about how to follow local guidelines when they were long and ambiguous or did not reflect national or international guidelines and that sufficient space to isolate patients was also seen as essential for the implementation of the guidelines.

Low-certainty evidence showed that people with long aprons had less contamination than those with coveralls, and the coveralls were more challenging to wear. Besides, better coverage of the

dress-cuff interface can lead to less contamination compared to standard PPE, also with evidence of low certainty. It is uncertain regarding the best use of PPE for the control of the COVID-19 dissemination because the related evidence was of very low certainty.

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Table 1. Electronic search strategy and results in the Cochrane Database of Systematic Reviews

Line	Searched Terms	Number of Results
#1	MeSH descriptor: [Coronavirus Infections] explode all trees	38
#2	MeSH descriptor: [Coronavirus] explode all trees	11
#3	(severe acute respiratory syndrome coronavirus 2) or (Wuhan coronavirus) or (Wuhan seafood market pneumonia virus) or (COVID19 virus) or (COVID-19 virus) or (coronavirus disease 2019 virus) or (SARS-CoV-2) or (SARS2) or (2019 novel coronavirus)	68
#4	COVID-19 or (2019 novel coronavirus infection) or (COVID-19 pandemic) or (coronavirus disease-19) or (COVID19) or (2019 novel coronavirus disease) or (coronavirus disease 2019)	69
#5	Coronavirus* or Deltacoronavirus* or Deltacoronavirus* or (Munia coronavirus* HKU13) or (Coronavirus* HKU15) or (Coronavirus* Rabbit) or (Bulbul coronavirus* HKU11) or (Thrush coronavirus* HKU12)	154
#6	#1 or #2 or #3 or #4 or #5	172
#7	Filter: Cochrane Reviews	19

Table 2. Details of review design, characteristics of interventions, comparisons, participants, main results and certainty of evidence, assessed by GRADE

Reference / Review design **Types of primary studies analysed in the review**	**Interventions**	**Comparisons**	**Participants**	**Main Results**	**GRADE**
Nussbaumer-Streit et al.[4] / rapid review • Cohort • Case-control • Time series • Interrupted time series • Case series • Mathematical modelling studies	Different types and quarantine locations for individuals. They included studies combining isolation and quarantine.	• No quarantine. • Different types and quarantine locations. • Public health measures without quarantine to reduce the spread of the virus (isolation, social distance, personal protective equipment, hand hygiene, others).	• (KQ1) contacts of a confirmed or suspected case of COVID-19 (SARS or MERS) or individuals living in areas with high rates of transmission; • (KQ2) individuals returning from countries with a declared outbreak of COVID-19 (SARS or MERS), defined by WHO as an 'occurrence of cases of disease above normal expectations'.	● Quarantine of people exposed to confirmed or suspected cases prevented 44% - 81% of incident cases and 31% - 63% of deaths compared to no measure (incident cases: four modelling studies at COVID-19, SARS; mortality: two modelling studies at COVID-19, SARS).	• Low certainty
				● The earlier the quarantine measures are implemented, the greater the cost savings (two modelling studies on SARS).	• Low certainty
				● The effect of	• Low

				quarantining travellers from a country with a reported outbreak was small in reducing the incidence of illness and deaths (two modelling studies on SARS).	certainty
				● When the models combined quarantine with other prevention and control measures, including school closures, travel restrictions and social distance, modelling studies demonstrated a greater effect in reducing new cases, transmissions and deaths than individual measures alone (cases incidents: four modelling studies at COVID-19; subsequent transmission: two modelling studies at COVID-19; mortality: two modelling studies at COVID-19).	• Low certainty
Houghton et al.[2] / rapid review (synthesis of	• Early recognition and source control (screening,	Control group is not evident from the nature	Most of the included studies involved nurses	● Health professionals felt insecure about	● Moderate confidence

evidence) • Mixed method designs (qualitative aspect)	breathing hygiene). • Administrative controls (isolation, spatial separation, cohort of patients). • Environmental and engineering controls (cleaning and disinfection, ventilation). • PPE (dressing and undressing), aprons, gloves, masks, glasses). • Hand hygiene.	of the review.	(14 studies) or doctors (9 studies). Other types of health professionals included in the studies were occupational therapists, respiratory therapists and physical therapists; auxiliary personnel responsible for patient care, such as porters and domestic workers; laboratory technicians; infection control professionals; and managers.	how to follow local guidelines when they were long and ambiguous or did not reflect national or international guidelines.	
				● Clear communication about ICP guidelines was considered vital for its implementation.	● High confidence
				● Sufficient space to isolate patients was also considered essential for the implementation of the guidelines.	● Moderate confidence
				● The lack of PPE and poor quality equipment was a serious concern for health workers and managers.	● Moderate confidence
				● Health professionals believed that they followed ICP guidelines more closely when they saw their value.	● Moderate confidence
				● Health professionals	• Low

				pointed out the importance of including all employees (cleaning, doormen, kitchen and other support staff) when implementing ICP guidelines.	confidence
Verbeek et al.[3] / traditional systematic review • RCT • Non-randomized controlled trial • Cohort • Case-control • Prospective and retrospective controlled field studies	• Different types of full body protection (PPE), different compositions or amounts of PPE (body protection, such as aprons, overalls; eye and face protection in glasses, goggles, face mask visors or masks or hoods that cover the entire head; hand protection: gloves; and foot protection: boots). • Different parts of PPE or different procedures or protocols for placing and producing PPE. • Effectiveness of training to increase compliance with existing guidelines on the selection or use of PPE, including, but not limited to: education (courses); practical training; information only	Comparisons were grouped according to similarity. Studies without a comparator group were not included.	• For simulation studies, any type of participant (volunteer or health professional) using PPE designed for Ebola virus disease or highly infectious diseases comparable with serious consequences was included. • For field studies, only studies carried out with health professionals or auxiliaries exposed to patients' body fluids in the form of splashes, droplets or aerosols contaminated with particles of highly infectious diseases that have serious health consequences, such as Ebola virus, SARS or COVID-19.	● Using a respirator and energized air purifier with overalls can protect against the risk of contamination better than an N95 mask and gown (RR 0.27, 95% CI 0.17 to 0.43), but it was more difficult dressing (non-conformity: RR 7.5, 95% CI 1.81 to 31.1).	● Very low certainty
				● In an RCT (59 participants), people with a long gown had less contamination than those with a coverall, and the coverall was more difficult to wear	• Low certainty
				● The following modifications to the	● Very low certainty

	(such as posters, guidance leaflets, etc.); audit and feedback, or monetary or organizational incentives.		• Studies carried out with the laboratory team were excluded because the preventive measures in the laboratories are more detailed and easier to comply with.	PPE design can lead to less contamination compared to standard PPE: combination of sealed gown and glove (RR 0.27, 95% CI 0.09 to 0.78), a more suitable dress around neck, wrists and hands (RR 0.08, 95% CI 0.01 to 0.55), additional guides to grip to facilitate the use of masks (RR 0.33, 95% CI 0.14 0.80) or gloves (RR 0.22, 95% CI 0.15 to 0.31).	
				● better coverage of the dress-cuff interface can lead to less contamination compared to standard PPE (RR 0.45, 95% CI 0.26 to 0.78)	• Low certainty
				● Using the CDC recommendations can lead to less contamination compared to no guidance (small spots: MD -5.44, 95% CI -7.43 to -3.45).	● Very low certainty

				● The use of additional computer simulation can lead to fewer errors in the process (MD -1.2, 95% CI -1.6 to -0.7).	● Very low certainty

GRADE: Grading of Recommendations, Assessment, Development and Evaluation; RCT = randomized clinical trials; PPE = personal protective equipment; KQ1 = key question 1; KQ2 = key question 2; SARS = severe acute respiratory syndrome; MERS = Middle East respiratory syndrome; WHO = World Health Organization; IPC = infection control and prevention; RR = relative risk; CI = confidence interval; CDC = Centers for Disease Control and Prevention; MD = mean difference.