Nursing Interventions For Prevention of Corneal Injury: A Protocol For A Systematic Review

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Protocol

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Abstract

Background: Critically ill patients are vulnerable to corneal injury and the incidence of this adverse event remains high in these patients. Randomized clinical trials have been assessing different types of interventions, hindering nurses' clinical practice for the prevention of corneal injury in critically ill patients. The aim of this systematic review is to identify the most effective nursing interventions to prevent corneal injury in critically ill sedated and mechanically ventilated patients.

Methods: A systematic review of intervention studies will be conducted and reported according to the Preferred Reporting Items for Systematic Reviews and Meta Analyses 2020, in the following electronic databases: Cumulative Index to Nursing and Allied Health Literature, Cochrane Central, Embase, Latin American and Caribbean Literature in Health Sciences, Livivo, PubMed, Scopus and Web of Science. The search of the grey literature will be undertaken on Google Scholar. No language or year of publication restrictions will be applied for the selection of primary studies. Study selection and data extraction will be performed by two independent reviewers who will screen the titles and abstracts of the retrieved papers to assess the studies for inclusion. Disagreements between reviewers, during study selection, will be resolved by discussion with a third reviewer. The inclusion criteria will be epidemiologic intervention studies evaluating nursing interventions to prevent or decrease the occurrence of corneal injury in critically ill sedated and mechanically ventilated patients. Methodological quality of the studies will be assessed using the Risk of Bias and Robins-2 tools. Quality of evidence will be assessed using the Grading of Recommendations Assessment, Development and Evaluation system.

Discussion: this study has a potencial to identify the most effective nursing interventions for prevention corneal injury in critically ill sedated and mechanically ventilated patients.

Systematic review registration: The protocol of this research is approved in PROSPERO under protocol No. 253289.

Background

Critically ill patients are more susceptible for developing corneal injury because the decline in the protective mechanisms due to the lower level of consciousness, use of sedatives, muscle blockers, mechanical ventilation, among other factors. These factors may alter the blink and the eyelid closure movements that are responsible for lubricating and protecting the corneas, respectively [1–12].

Review papers involving studies about the different interventions to prevent corneal injury in ICU have already been conducted. However, these reviews are outdated, and it was also unable to reach a conclusion on the most effective nursing interventions. Ultimately, previous reviews proposed that further studies should be conducted [13–15].

In this sense, the incidence of corneal injury in critically ill patients remains high in several countries [9, 12, 16, 17]. In India varied from 21.0–58.5% [16, 17], whereas the incidence of this event in Jordan and

Iran were 13.8% and 57.0%, respectively [2, 5]. In Brazil, the incidence ranged from 18.8% (state of Acre) [11] to 59.4% (state of Minas Gerais) [12], with patients more unstable in latter state. The lowest incidence rates were 2.0% in the United Kingdom and Turkey, where protocols of nursing practices have been implemented in the ICUs. The interventions aiming to prevent corneal injuries in these countries demonstrate that nurses can improve the quality of care and minimize the occurrence of this adverse event [17–20].

Studies have shown that nurse's knowledge about eye care and corneal injury prevention is limited [8, 11, 17–19]. In addition, nursing care in ICUs places more emphasis on the cardiovascular, renal, and neurological systems. Eye care is usually neglected because critically ill patient does not report discomfort about dry or irritated eye, increasing the risk of corneal injury. These factors along with the lack of clinical practice guidelines related to nursing interventions may contribute to the high incidence of corneal injury in critically ill patients [8, 18, 20–22].

Corneas are thin, avascular structures located in the anterior part of the eyeball that protect the eyes. A lubricated and protected cornea provides adequate vision for the individual. However, patients damaged corneas may experience temporary or permanent vision impairment that impact on daily living activities and self-esteem. Organ donation process may be rendered unviable when the person has damaged corneas [1, 8, 9, 23].

The Risk for Corneal Injury (00245) nursing diagnosis is included in Domain 11, safety/protection, Class 2, physical injury, of the NANDA International, Inc. (NANDA-I). The only review of this nursing diagnosis was in 2017 (level of evidence 2.1), which suggests the need for further research like literature synthesis to improve the level of evidence of this nursing diagnosis. Risk for corneal injury nursing diagnosis is defined as "Susceptible to infection or inflammatory lesion in the corneal tissue that can affect superficial or deep layers, which may compromise health". The risk factors are insufficient knowledge, exposure of the eyeball, pharmacological agents (sedatives and muscle blocking drugs), periorbital edema, mechanical ventilation, lowering the level of consciousness, prolonged hospitalization, blinking < 5 times per minute, oxygen therapy, tracheostomy, and mechanical ventilation [7, 11].

Randomized clinical trials of nursing interventions for the prevention of corneal injury in critically ill patients have been conducted in several countries including Sweden, the United Kingdom, Iran, Saudi Arabia, Turkey, Palestine, India, and the United States. Different recommendations to prevent of corneal injury have been proposed, including the use of saline solution with gauze, manual closure of the eyelids, occlusion of the eyelids with micropore tape, use of glasses, ocular lubricant drops, ocular lubricant gel or ointment and use of polyethylene moist chamber. The large number of treatment options may hamper the decision-making process for the nurse to select the most effective nursing intervention for critically ill patients, so network meta-analysis is the ideal statistical approach to synthesize data and identify the interventions most effectives for preventing corneal injury [1–4, 6, 8, 10, 14, 24, 25].

Recent studies indicate the concomitant use of a polyethylene moist chamber and ocular gel lubricant appear to be the most effective nursing interventions for the prevention of corneal injury in critically ill

patients. However, contemporary synthesis of the available evidence is needed to elucidate the most effective nursing interventions for the prevention of corneal injury [8, 10, 15, 26]. The above-mentioned gaps in the literature suggest the need to carry out this research, especially through the synthesis of robust evidence, aiming to reduce corneal injury in critically ill sedated and mechanically ventilated patients [7, 14, 15].

This protocol aims to contribute to intensive nurse's decision-making process in clinical practice, for the prevention of corneal injury, by systematically reviewing the evidence of interventions for prevention of corneal injury in critically ill patients. Quantitative synthesis combining data from primary studies through meta-analysis will be conducted if appropriate [13–15, 27].

Aim

To identify the most effective nursing interventions to prevent corneal injury in critically ill sedated and mechanically ventilated patients.

Methods

This systematic review of intervention studies (nursing interventions) will be planned and reported according to the Preferred Reporting Items for Systematic Reviews and Meta Analyses 2020 (PRISMA 2020) [14, 15]. The systematic review protocol was registered in the Prospective International Register of Systematic Reviews (PROSPERO), registration number “XX”.

The research question was developed according to the acronym Population, Intervention, Comparison or Control and Outcome (PICO): Which nursing interventions are more effective for the prevention of corneal injury in critically ill sedated and mechanically ventilated patients?

Hypothesis: the use of a polyethylene moist chamber and ocular gel lubricant appear to be the most effective nursing interventions for the prevention of corneal injury in critically ill patients.

Search Strategy

Will be conducted in the following electronic databases: Cinahl, Cochrane CENTRAL, Embase, Lilacs, Livivo, PubMed, Scopus, and Web of Science. Grey literature search will be carried out on Google Scholar [14, 15]. The reference lists of eligible studies will be screened for additional relevant research. No language or year of publication restrictions will be applied for the selection of primary studies.

Study selection and data extraction: will be performed in two steps. First, two reviewers will evaluate independently the studies according to titles and abstracts for inclusion according to the eligibility criteria. If the title and abstract are not enough to elucidate the initial selection of the papers, the full evaluation of these ones will be carried out.

Eligibility Criteria

Inclusion criteria: adult and/or elderly sedated and mechanically ventilated patients admitted to ICUs. Exclusion criteria: neonates or children's patients and those without sedation and/or mechanical ventilation will be excluded.

Intervention: any form of nursing intervention for the prevention of corneal injury in ICU will be included.

Comparator: critically ill adult and/or elderly patients who did not receive preventive interventions for corneal injury.

Outcomes: the outcome measures will include healthy cornea or reduction of corneal injury.

Study design: will be include randomized controlled trials, non-randomized controlled trials, and cohort studies [14].

Data Extraction

At the end of the search, the results will be transferred to the Rayyan platform for double-blind selection of articles by the reviewers (which can be accessed for free at: https://rayyan.qcri.org). Any disagreement of the selection process will be resolved by discussion with a third reviewer [14, 15]. The selected articles will be stored in the EndNote® platform to remove duplicates and for analytical purposes [14, 15].

Risk Of Bias And Quality Of Evidence

The methodological quality of the Randomized Clinical Trials (RCTs) will be assessed using the Cochrane risk-of-bias assessment tool for randomized trials (RoB 2.0)[28]. RoB 2.0 is composed of 22 items grouped into five domains to assess the different types of bias, including: Bias arising from the randomization process, Bias due to deviations from intended interventions, Bias due to missing outcome data, in measurement of the outcome, and in selection of the reported result. The following response options will be used: 'yes', 'probably yes', 'probably no', 'no', 'not applicable', and 'no information'. The overall risk of bias assessment will be carried out and will be classified as:

- *Low risk of bias*: when the study is judged at low risk of bias for all domains for thw result.
- *Some concerns*: when the study points out some issues in at least one domain for the result but does not present a high risk of bias for any domain.
- *High risk of bias*: the study presents a high risk of bias in at least one domain for the result, or the study is judged to have some issues in multiple domains in a way that substantially lowers confidence in the result.

The quality of non-randomized studies will be assessed using the Risk of Bias of Interventions (ROBINS-I) tool [28].

Cohort studies will be evaluated by the modified version of the Newcastle-Ottawa Scale [29]. This tool evaluates studies based on 8 domains using a star system, which are divided into 3 criteria: patient selection, comparability of study groups, and outcome assessment. High-quality studies at low risk of bias could receive a maximum of 9 stars. Studies that have obtained 8, 7, or 6 stars will be considered to have moderate quality, and a rating of 5 stars or less are low quality studies.

The certainty of the evidence will be assessed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system.

Data Synthesis And Analysis

Quantitative synthesis will be performed through meta-analysis depending on data availability [14, 28]. In this study, the outcome of the interventions will be used if the intervention aimed to prevent or to reduce the likelihood of corneal injury [14]. Estimates from studies reporting binary outcomes (dichotomous variables) will be pooled using the reported Relative Risk (RR) or Odds Ratio (OR) with a 95% confidence interval (CI). Studies reporting outcomes assessed through continuous variables will be grouped using mean differences and the inverse variance method. The standard mean differences will be used to combine studies that measured the same outcome but used different methods [14]. If necessary, data transformation will be conducted to convert continuous effect size measurements, and OR into RR. Further information about data transformation is available elsewhere [30]. Analysis of the cost-effectiveness of interventions will not be performed.

A network meta-analysis will be carried out to compare the different types of interventions for the prevention of corneal injury in critically ill patients, even if they were not directly compared in the primary studies. Forest plot will be used to identify the different types of interventions compared with no treatment. The differences between the interventions will be measured by head-to-head analysis. The Surface under the cumulative ranking value (SUCRA value) will be used to identify which intervention has the highest effectiveness [14, 28].

Statistical heterogeneity will be assessed by visual inspection of a forest plot, $\chi 2$ test or the I^2 statistic test. The interpretation of I^2 will be: 0–40%: might not be important; 30–60%: moderate heterogeneity; 50–90%: substantial heterogeneity; 75–100%: considerable heterogeneity. The importance of the observed value of I^2 depends on (i) magnitude and direction of effects and (ii) strength of evidence for heterogeneity [14, 28].

Subgroup analysis will be performed, if possible, to identify potential modifiers effect such as participant characteristics including sex, age and type and duration of the intervention. Sensitivity analysis will also be performed to assess the impact of studies with high risk of bias. It will be discussed whether studies

with lower quality will be excluded based on sample size, evidence, and the influence of the effect on group size [14]. Statistical analyses will be performed by Cochrane's Review Manager Software (v.5.4).

Discussion

This study has a potencial to identify the most effective nursing interventions for prevention corneal injury in critically ill sedated and mechanically ventilated patients.

Abbreviations

ICU: Intensive Care Unit; NANDA-I: NANDA International; GCS: Glasgow Coma Scale; PICO: Population, Intervention, Comparison or Control and Outcome; PRISMA 20: Preferred Reporting Items for Systematic Reviews and Meta Analyses 2020; PROSPERO: Prospective International Register of Systematic Reviews; CINAHL: Cumulative Index to Nursing and Allied Health Literature; LILACS: Latin American and Caribbean Literature in Health Sciences; RCTs: Randomized Clinical Trials; ROBINS-I : Risk of Bias In Non-randomised Studies - of Interventions; GRADE: Grading of Recommendations Assessment, Development and Evaluation; RR: Relative Risk; OR: Odds Ratio; CI: Confidence Interval; SUCRA value: Surface under the cumulative ranking value.

Declarations

Ethical Approval and Consent to participate

Patients and/or the public were not involved in the design, conduct, reporting, or dissemination plans of this research.

Consent for publication

In accordance with PRISMA-2020 Guidelines, the review protocol was submitted in PROSPERO. The protocol and results of this study will be submitted to peer-reviewed journals. In addition, it is intended that the abstract will be presented at a national and/or international conference

Availability of supporting data

Upon completion of the study, the datasets generated and/or analysed during the current study will be available to those investigators who request to corresponding author by E-mail: patriciarezende@usp.br

Competing interests

The authors have no conflict of interest to declare.

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Authors' contributions

PRP, FREGS, RCCPS, MVV, MF and GLV developed the systematic review protocol, contributed to the development of the data selection criteria, assessment of the risk of bias and extraction and analysis of the data, developed the search strategy and read, reviewed, and approved the final version.

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