

INPLASY

The Efficacy of Subglottic Secretion Drainage in Preventing Ventilator-Associated Pneumonia in the Intensive Care Unit: A Systematic Review and Meta-Analysis

INPLASY202630098

doi: 10.37766/inplasy2026.3.0098

Received: 27 March 2026

Published: 27 March 2026

Hu, HF; Tursuniyazi, R.

Corresponding author:

HengFen Hu

huhengfenfen@126.com

Author Affiliation:

Medical School, Hunan Vocational and Technical College of Environmental Biology, Hengyang, China.

ADMINISTRATIVE INFORMATION

Support - No.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202630098

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 27 March 2026 and was last updated on 27 March 2026.

INTRODUCTION

Review question / Objective To evaluate, using the PICOS framework, whether subglottic secretion drainage (SSD), compared with routine mechanical ventilation nursing or no SSD, reduces the incidence of ventilator-associated pneumonia (VAP) and improves related clinical outcomes in critically ill adult patients in the intensive care unit (ICU) receiving mechanical ventilation for at least 48 hours. The primary outcome was the incidence of VAP. Secondary outcomes included duration of mechanical ventilation, length of ICU stay, length of hospital stay, mortality, tracheostomy, incidence of VAP per 1000 ventilator days, and detection rates of Gram-positive and Gram-negative bacteria. Only randomized controlled trials (RCTs) were included.

Condition being studied The condition being studied is ventilator-associated pneumonia (VAP) in critically ill adult patients admitted to the intensive care unit (ICU) and receiving mechanical ventilation

for at least 48 hours. VAP is a common hospital-acquired infection that develops during or after mechanical ventilation, usually as a result of bacterial aspiration into the lower respiratory tract after secretions accumulate above the endotracheal tube cuff. It is associated with a high incidence and mortality, prolonged mechanical ventilation, longer ICU and hospital stay, increased healthcare costs, and worse patient prognosis. Because pathogenic bacteria in subglottic secretions can enter the lower airway and promote infection, VAP prevention is clinically important in ICU care. This review focuses on VAP as the target condition and evaluates whether subglottic secretion drainage can help prevent its occurrence and improve related outcomes in mechanically ventilated ICU patients.

METHODS

Participant or population The review will include critically ill adult patients admitted to the intensive care unit (ICU) who require mechanical ventilation via oral or nasal endotracheal intubation or

tracheostomy/tracheal incision for at least 48 hours. Eligible participants are adults aged 18 years or older. Studies involving pregnant patients, patients with mental disorders, patients with unclear mechanical ventilation time before ICU admission, or non-human subjects will be excluded.

Intervention The intervention of interest is subglottic secretion drainage (SSD) in critically ill adult ICU patients receiving mechanical ventilation for at least 48 hours. SSD refers to negative-pressure drainage of secretions accumulated above the endotracheal tube cuff through a drainage channel attached to the tracheal tube wall. Eligible interventions will include all SSD methods, including continuous aspiration of subglottic secretion (CASS), intermittent aspiration of subglottic secretion (IASS), and subglottic rinsing.

Comparator The comparator will be routine mechanical ventilation (MV) nursing or standard care without subglottic secretion drainage (SSD) in critically ill adult ICU patients receiving mechanical ventilation for at least 48 hours. In the included studies, patients in the control group received routine MV nursing, while the experimental group received one of the SSD methods.

Study designs to be included Randomized controlled trials (RCTs) evaluating the effects of subglottic secretion drainage (SSD) in mechanically ventilated adult ICU patients will be included. Observational studies, retrospective studies, reviews, conference abstracts, case reports, animal studies, duplicate publications, and studies with unavailable full text or incomplete data will be excluded.

Eligibility criteria In addition to the PICOS criteria, studies had to be published between January 2000 and May 2024, with complete and clearly reported outcome data. Included studies were required to report at least one predefined outcome in detail. Studies were excluded if they had incomplete data, unavailable outcome indicators, unknown mechanical ventilation time before ICU admission, duplicate publication, or no actual SSD treatment. Literature reviews, expert commentary, editorials, news reports, product descriptions, animal experiments, and in vitro studies were also excluded. Pregnant women and patients with mental disorders were excluded.

Information sources The review will search electronic databases for studies published between January 2000 and May 2024. The main

information sources include PubMed, Embase, Cochrane Library, and Web of Science. The manuscript also reports retrieval from other online databases, including Nature, Springer, and Science Direct. Both MeSH terms and free-text terms will be used, combined with “AND” and “OR”. In addition, article screening and data extraction will be conducted independently by two reviewers, and missing data will be supplemented by contacting the first authors when necessary.

Main outcome(s) The primary outcome of the review is the incidence of ventilator-associated pneumonia (VAP) in mechanically ventilated adult ICU patients receiving subglottic secretion drainage (SSD) versus routine care/no SSD. Outcomes will be assessed during the period of mechanical ventilation and ICU care, as reported in the included studies. For dichotomous outcomes such as VAP incidence, effect estimates will be expressed as risk ratios (RRs) or odds ratios (ORs) with 95% confidence intervals (CIs). The manuscript identifies VAP incidence as the main outcome and reports pooled VAP effects using ORs.

Quality assessment / Risk of bias analysis The methodological quality of the included studies will be assessed using the Cochrane Reviewer's Handbook 5.1.0 risk-of-bias criteria for randomized controlled trials. Studies will be evaluated across seven domains, including adequacy of the research methods, random sequence generation, clarity of reported findings, selective reporting, blinding of participants and personnel, blinding of outcome assessment, and completeness of outcome data. Each domain will be judged as having low, high, or unclear risk of bias. Two reviewers will independently assess the included studies and cross-check the results, with any disagreements resolved through discussion or consultation with a third reviewer.

Strategy of data synthesis Data will be synthesized using meta-analysis in RevMan 5.3. Extracted data will first be organized in Excel 2016. For dichotomous outcomes, effect sizes will be expressed as risk ratios (RRs) with 95% confidence intervals (CIs); for continuous outcomes, mean differences (MDs), standard deviations (SDs), and 95% CIs will be used. Statistical heterogeneity will be assessed using the chi-square test and I^2 statistic. Heterogeneity will be interpreted as low when $I^2 < 25\%$, moderate when $25\% < I^2 < 50\%$. A fixed-effect model will be used when $I^2 < 50\%$. Forest plots will be generated for pooled analyses, and funnel plots will be used to assess potential publication bias. Sensitivity

analysis will be conducted by excluding the studies with the poorest quality. Statistical significance will be set at $P < 0.05$.

Subgroup analysis No formal subgroup analysis was explicitly reported. If sufficient data are available, subgroup analyses may be conducted according to the type of subglottic secretion drainage (SSD) used, such as continuous aspiration of subglottic secretion (CASS), intermittent aspiration of subglottic secretion (IASS/ISD), and subglottic rinsing, because the included studies involved different SSD methods.

Sensitivity analysis Sensitivity analysis will be conducted by excluding the studies with the poorest methodological quality to evaluate the robustness and stability of the pooled results. If the overall findings remain materially unchanged after exclusion, the results will be considered stable.

Country(ies) involved China. The authors' listed institutional affiliations are Medical School, Hunan Vocational and Technical College of Environmental Biology, Hengyang, China and Tulufan Vocational Technical College, Tulufan, China. Based on the affiliations.

Keywords VAP; SSD; ICU; mechanical ventilation; CASS; IASS; randomized controlled trials; meta-analysis.

Contributions of each author

Author 1 - HengFen Hu.

Author 2 - Rexidan Tursuniyazi.