

INPLASY

Oral care delivery for mechanically ventilated patients in intensive care units across country income levels since 2015: a scoping review protocol

INPLASY2026100048

doi: 10.37766/inplasy2026.10.0048

Received: 10 October 2026

Published: 10 October 2026

Song, ZH.

Corresponding author:

Song Zihao

1214655790@qq.com

Author Affiliation:Intensive Care Unit, Yangchun
People's Hospital, Yangchun,
Guangdong Province, China.**ADMINISTRATIVE INFORMATION****Support** - This scoping review received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.**Review Stage at time of this submission** - Preliminary searches.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY2026100048**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 10 October 2026 and was last updated on 10 October 2026.**INTRODUCTION**

Review question / Objective This scoping review addresses the delivery of oral care to patients receiving invasive mechanical ventilation in intensive care units, and asks whether and how that delivery differs across country income levels. Its objective is to map what is reported about oral care delivery in each income group, to identify the reported barriers and facilitators, and to examine whether the methods used to measure oral care delivery are themselves patterned by income level.

Four questions guide the review. First, what are the reported solutions and concentrations, tools, frequency, personnel, assessment practices and documentation for oral care delivery in each country income group? Second, what barriers and facilitators are reported in each income group? Third, how is the available evidence distributed across income groups and patient age groups, and where is it absent rather than merely limited? Fourth, does the measurement approach used to

assess delivery differ systematically across income groups?

The review is descriptive and hypothesis-generating rather than hypothesis-testing, and no meta-analysis is planned. The question is framed using the Population, Concept and Context elements recommended for scoping reviews.

Population. Patients of any age receiving invasive mechanical ventilation or endotracheal intubation in an intensive care unit, including adult, paediatric and neonatal patients. The nursing staff who deliver oral care to these patients are also within scope, because much of the evidence describes what staff do rather than what patients received.

Concept. The delivery of oral care as it is actually carried out: the solutions and concentrations used, the tools used, the frequency and timing, the personnel who perform it, whether and how oral health is assessed, and whether the procedure is documented. Reported delivery, adherence and compliance rates are within scope, as are reported barriers and facilitators.

A distinguishing feature of this review is that the measurement approach used to assess delivery is treated as an object of analysis rather than as a fixed attribute of the studies. Reported figures are not commensurable across measurement types. A questionnaire asks staff what they do; direct observation records what was done in a sampled period; chart review records what was written down; an audit judges practice against a predefined standard; and institutional reporting describes whether a protocol exists rather than whether it is followed. Each answers a different question and carries different biases.

Self-reported practice is prone to recall and social desirability bias and typically yields higher figures than observation of the same practice. The review therefore records the measurement basis of every reported value and never pools values across measurement types.

Context. Intensive care units in any country or region, at any income level. Country income level is used as an analytical stratifier and never as a search filter, so studies are eligible regardless of where they were conducted; income groups follow World Bank classifications. Literature published from 1 January 2015 onwards is eligible, reflecting the substantial change in international guidance on oral care during this period. No language restriction is applied; the practical consequences are reported as a limitation.

Rationale The condition examined in this review is the delivery of oral care to patients receiving invasive mechanical ventilation, and the variation in that delivery between intensive care units and between countries. Oral care in this population is a nursing procedure rather than a medical treatment. It comprises routine cleansing of the oral cavity, teeth, gums and mucosa, the management of secretions and of ventilator-associated oral lesions, and, where it is practised, formal assessment of oral health. It involves a solution, a tool, a frequency, a person who performs it, and often a written protocol.

The clinical context that makes this procedure important is invasive mechanical ventilation itself. Endotracheal intubation bypasses the normal defences of the upper airway, holds the mouth open, prevents effective swallowing and coughing, and provides a surface on which microbial biofilm forms. Patients are frequently sedated and dependent on staff for a task that is uncomfortable and easily deferred when a unit is busy. Oropharyngeal colonisation in these circumstances is a recognised antecedent of ventilator-associated pneumonia, which remains among the most common healthcare-associated infections in intensive care units and is associated with

prolonged ventilation, increased antibiotic consumption, and substantial attributable morbidity and mortality.

Oral care is therefore one of the few nursing interventions with a plausible causal pathway to the prevention of a major intensive care complication. It also depends heavily on conditions outside the individual nurse's control: consumable supplies that must be procurable and stocked; someone assigned, with time, to perform it; a written protocol for consistency across shifts and staff; documentation if adherence is ever to be measured; and training, because guidance on which solutions to use has changed substantially, most notably away from routine chlorhexidine and towards toothbrushing. These features make oral care an unusually clear case for examining how material and institutional conditions shape what patients actually receive.

The specific problem this review examines is that reported oral care delivery varies widely, and it is unclear whether that variation follows a systematic pattern across country income levels. Income level is closely associated with the resources available in intensive care, including which solutions and tools can be procured, whether written protocols exist, whether oral care is documented, and whether continuing education is provided. These resources are also unevenly distributed within countries, but the between-country gradient is large enough to be examined systematically, and it is the level at which most international guidance is issued.

The existing synthesised evidence does not resolve this question. A recent scoping review of 27 cross-sectional studies on nurses' knowledge, attitudes and practices regarding oral care for mechanically ventilated patients concluded that the absence of standardised assessment tools limits comparison across studies. That review did not stratify findings by country income level, and it restricted eligibility to surveys published in English, drawing on a small number of mainstream sources. It therefore excludes the study types that can report what patients actually received rather than what staff report doing, and those most likely to be produced in lower-income settings, where local and regional journals are the principal route to publication.

The present review examines that observation empirically. It asks what is reported about oral care delivery in each income group, what barriers are reported, and whether the measurement approach used to assess delivery is itself patterned by income level. The third question must be answered before the first can be interpreted, because if the methods used to measure oral care delivery differ systematically across income groups, then

comparison of reported adherence rates may reflect the distribution of measurement instruments rather than genuine differences in care quality.

Condition being studied The condition examined in this review is the delivery of oral care to patients receiving invasive mechanical ventilation in intensive care units, and the variation in that delivery between units and between countries at different income levels.

Oral care in this population is a nursing procedure rather than a medical treatment. It comprises routine cleansing of the oral cavity, teeth, gums and mucosa; the management of secretions and of ventilator-associated oral lesions; and, where it is practised, formal assessment of oral health before and after the procedure. In practice it is defined by five elements: the solution and concentration used, the tool or method of application, the frequency with which it is performed, the person who performs it, and, in units that have one, the written protocol that governs all of these. The review charts each of these five elements separately rather than treating oral care as a single undifferentiated act.

The clinical setting in which this condition arises is invasive mechanical ventilation. Endotracheal intubation bypasses the normal defences of the upper airway, holds the mouth open, prevents effective swallowing and coughing, and provides a surface on which microbial biofilm forms. Patients are frequently sedated and dependent on staff for a task that is uncomfortable and easily deferred when a unit is busy. Oropharyngeal colonisation under these conditions is a recognised antecedent of ventilator-associated pneumonia.

Two clarifications about the scope of the condition are important. First, the condition examined here is the delivery of oral care, not ventilator-associated pneumonia. Pneumonia appears in this review only as the clinical rationale for studying oral care, and as one possible patient-level outcome reported by included studies; it is not itself the condition under study. Second, the review concerns what is actually delivered rather than what is known or intended. Studies of nurses' knowledge or attitudes are eligible only where they also report delivery, because the question is what patients received.

The variation that gives the condition its analytic interest is that oral care delivery depends heavily on conditions outside the individual nurse's control. It requires consumable supplies that must be procurable and stocked; someone assigned, with time, to perform it; a written protocol if it is to be performed consistently across shifts and staff; documentation if adherence is ever to be measured; and training, because guidance on

which solutions to use has changed substantially over the past decade, most notably away from routine chlorhexidine and towards toothbrushing. These conditions are unequally distributed between countries at different income levels, which is why country income level is examined here as an analytical stratifier rather than treated as background.

METHODS

Search strategy A three-tier search strategy is used. The tiered structure follows directly from the question being asked, because bibliographic indexes do not cover the world's nursing literature evenly. Journals published in high-income countries are indexed comprehensively and are written in English; journals published elsewhere are indexed partially, if at all, and are more often published in other languages. A review that searches only the major international databases therefore samples the literature that those databases happen to hold, rather than the global literature. Where the review question is itself about differences between countries at different income levels, that bias operates directly on the exposure of interest. The three tiers are therefore a methodological requirement of this particular question, not a general recommendation.

Tier 1 comprises mainstream bibliographic databases. PubMed is searched with the [tiab] field tag and a publication-date limit from 1 January 2015. Europe PMC is searched with every term entered against the title and abstract fields, and with a first-publication-date limit. Scopus and CINAHL are not available to the review team without institutional subscription, and this is reported as a limitation rather than left undisclosed.

Tier 2 comprises regional and open-access databases selected to reach literature that mainstream indexes under-represent: African Journals Online, the Directory of Open Access Journals, and the Eastern Africa Nursing and Midwifery Research Repository. Country-level searches are run within the Directory of Open Access Journals so that regional coverage can be examined directly, and so that a genuine absence of research in a region can be distinguished from a failure of the search to reach it. LILACS, the African Index Medicus, the Egyptian Knowledge Bank and Sabinet could not be reached from the study setting during the search period. This is reported as a limitation, and its consequences for the geographical distribution of the included evidence are discussed explicitly, because an unreachable database and an empty literature are easily confused in a published review.

Tier 3 comprises grey literature and citation tracking: OpenAlex, which covers institutional repositories, preprint servers and dissertations; the Wits institutional repository; OSF Preprints; and backward and forward citation tracking of every included study. Citation tracking is treated as a formal search source rather than as a supplement, because it is the only mechanism that can recover studies whose indexing is poor but whose content is directly relevant.

The search combines two concept groups, joined with the Boolean operator AND. The oral care group comprises oral care, oral hygiene, mouth care, toothbrushing, chlorhexidine, mouthwash and oral assessment. The population and setting group comprises intensive care, ICU, critical care, mechanically ventilated, mechanical ventilation, intubated, ventilator and ventilated. Terms within each group are combined with OR. Both groups include the range of vocabulary actually used in the field, so that a study is not excluded merely because it reports mouth care rather than oral care, or ventilated patients rather than mechanical ventilation. Controlled vocabulary is used where a database provides it, and free-text terms elsewhere. No language filter and no country filter is applied at the search stage; country coverage is addressed through the three-tier structure rather than through a filter, so that studies remain eligible regardless of where they were conducted.

Records retrieved from all sources are exported to reference management software and de-duplicated on digital object identifiers and titles before screening. The number of records retrieved from each source, the number remaining after de-duplication, and the number screened at each stage are reported in a PRISMA-ScR flow diagram. The full search strategy for every source, with the exact syntax used and the number of records retrieved from each, is provided as a supplementary file so that the searches can be reproduced, audited or updated.

Chinese-language databases, namely CNKI, Wanfang and VIP, were not searched, because automated access to these platforms was not available from the study setting. This is reported as a limitation. Chinese-language journals indexed with English abstracts were nevertheless reached through PubMed, Europe PMC and the Directory of Open Access Journals, and studies published in Chinese were included where the full text could be obtained. No search term in any language other than English was used, so the present protocol is submitted entirely in English.

Searching is terminated when further sources no longer yield studies that alter any established theme or conclusion. The search is therefore described as saturated under a pre-specified

stopping rule rather than exhaustive, because exhaustiveness cannot be demonstrated while several relevant regional databases remain unreachable. Records in languages other than English are assessed with the assistance of machine translation, with key data fields verified against the original text.

Participant or population Patients of any age receiving invasive mechanical ventilation or endotracheal intubation in an intensive care unit. This includes adult, paediatric and neonatal patients. No age group is excluded, and no upper or lower age limit is applied. Patients receiving non-invasive ventilation, high-flow nasal oxygen or supplemental oxygen only are not eligible, because their oral care requirements and the associated evidence base differ from those of intubated patients.

Nursing staff who deliver oral care to mechanically ventilated patients are also within the population of interest. This includes registered nurses, nursing assistants and other staff who perform or supervise the procedure. This group is included because a substantial part of the available evidence reports what staff do or report doing rather than what patients actually received, and because excluding it would remove most of the evidence from lower-income settings, where large observational studies of patients are less common. The population is therefore characterised at two levels. At the patient level, the interest is in what oral care was actually delivered and documented. At the staff level, the interest is in what is reported or observed to be delivered by those responsible for providing it. Both levels are charted and reported separately, and self-reported staff data are never treated as equivalent to patient-level observation.

Studies are eligible regardless of the country or region in which they were conducted. Country income level is used as an analytical stratifier and is not applied as an eligibility criterion, so that the population is not restricted by geography or income setting.

Studies conducted in any type of intensive care unit are eligible, including general, surgical, medical, cardiac, neurological, paediatric and neonatal units, and studies conducted in single or multiple centres are both eligible. Studies that report only on patients in settings other than intensive care, such as general wards, long-term care facilities or home care, are not eligible.

Intervention The intervention of interest is oral care as delivered to patients receiving invasive mechanical ventilation in intensive care units. It is examined as a nursing procedure that is actually

carried out, rather than as a therapeutic intervention whose effect on clinical outcomes is being estimated. No experimental intervention is administered by the review team, and no minimum or maximum dose, frequency or duration is specified as an eligibility criterion.

The intervention is characterised along five dimensions, each of which is charted separately. The first is the solution and concentration used, which may include chlorhexidine at various concentrations, saline, sterile water, sodium bicarbonate, mouthwash preparations, or no solution beyond mechanical cleansing. The second is the tool or method of application, which may include a toothbrush, gauze or swab, foam swabs, mouthwash rinse, or a combination of these. The third is the frequency and timing of oral care, which may be reported per shift, per day, as a number of episodes, or as a proportion of patients receiving care within a defined period. The fourth is the personnel who perform the procedure, which may include registered nurses, nursing assistants, or a combination. The fifth is the presence of a written oral care protocol governing any of the above.

Oral health assessment is also of interest where it forms part of the oral care procedure, including the instrument used and whether assessment is documented.

Studies of any intervention design are eligible, including randomised controlled trials, quasi-experimental studies, before-and-after studies, and evidence implementation or quality improvement projects. Studies that report only the effect of an oral care intervention on patient outcomes, such as ventilator-associated pneumonia incidence, without describing the oral care delivered, are not eligible, because the review concerns delivery rather than efficacy. Studies that describe both the intervention delivered and its outcomes are eligible, and the delivery data are charted.

The intervention is not restricted by country, income setting, language or publication type. Studies conducted in any type of intensive care unit, and studies examining oral care delivered by any category of staff, are eligible.

Comparator There is no clinical comparator in the conventional sense. No intervention is compared against placebo, against no treatment, or against an alternative active treatment, and no effect estimate is calculated. The review is a scoping review of what is reported about oral care delivery, and not a comparative effectiveness review.

The comparison of interest is between country income groups. Reported oral care delivery is examined separately within each World Bank income group, namely low-income, lower-middle-

income, upper-middle-income and high-income countries, and the findings for each group are presented alongside each other so that similarities and differences are visible. Country income level therefore functions as the comparator, and it is treated as an analytical stratifier rather than as a search filter or an eligibility criterion.

A second comparison is between measurement approaches rather than between populations. Reported delivery figures are compared across the methods used to obtain them, including direct observation, point-prevalence or chart review, audit against evidence-based criteria, self-administered questionnaire, institutional-level reporting, and patient-level outcomes. This comparison is included because the two comparisons are not independent: if self-report predominates in some income groups and observation in others, then any apparent difference between income groups may reflect the instruments used rather than the care delivered.

No statistical comparison between income groups is planned, no hypothesis test is performed, and no claim of statistical significance is made. Differences are described as differences in what has been reported, and are not presented as established differences in clinical practice. Studies are not required to include a comparator group in order to be eligible; single-group studies, surveys without a comparison arm, and qualitative studies are all eligible.

Study designs to be included Any study design is eligible. No design is excluded a priori, and this is a deliberate decision rather than an absence of criteria.

The designs expected to contribute evidence include: cross-sectional surveys of nursing staff; direct observational studies of care delivery at the bedside; point-prevalence surveys; retrospective chart review or documentation audits; audits of practice against evidence-based criteria; quality improvement and evidence implementation projects; quasi-experimental studies including before-and-after designs; randomised controlled trials and other controlled.

Eligibility criteria Inclusion criteria.

Participants. Patients of any age receiving invasive mechanical ventilation or endotracheal intubation in an intensive care unit, including adult, paediatric and neonatal patients. Nursing staff who deliver oral care to these patients, including registered nurses, nursing assistants and other staff who perform or supervise the procedure.

Concept. Reported delivery of oral care, comprising solutions and concentrations, tools, frequency and timing, personnel, oral health

assessment, and documentation; reported delivery, adherence or compliance rates; and reported barriers and facilitators. The measurement approach used to assess delivery is recorded for every reported value but does not determine eligibility, so that studies using different measurement approaches remain comparable at the level of description.

Context. Intensive care units in any country or region, at any income level. Country income level is used as an analytical stratifier and is not applied as a search filter.

Study design. Any design, including cross-sectional surveys, direct observation, point-prevalence surveys, retrospective chart review, audit against evidence-based criteria, quality improvement and evidence implementation projects, quasi-experimental studies, randomised controlled trials, mixed-methods studies, qualitative studies, and dissertations. No design is excluded. This is a deliberate decision: the study types that report what patients actually received are precisely those that a design-restricted search would remove, and they are also the types most likely to be produced in lower-income settings.

Publication period. From 1 January 2015 onwards. This boundary reflects the substantial change in international guidance on oral care during this period and keeps the review focused on current practice rather than on historical practice that no longer reflects guidance.

Language. No restriction. Records in languages other than English are assessed with the assistance of machine translation, with key data fields verified against the original text.

Exclusion criteria.

Settings other than intensive care, including general wards, long-term care facilities, nursing homes and home care. Patients who are not intubated or mechanically ventilated, including those receiving non-invasive ventilation or high-flow nasal oxygen only, because the oral care requirements and the evidence base differ.

Reviews, guidelines, editorials, commentaries, study protocols, and conference abstracts for which no complete data can be obtained. Records available only as abstracts are excluded from data synthesis but are recorded and reported separately, so that the volume and distribution of incomplete reporting is itself visible.

Animal studies, and purely laboratory or microbiological studies without human participants or reported clinical practice.

Studies published before 1 January 2015. Where a study reports data collected partly before this date but is published after it, the study is eligible and the reporting period is recorded.

Studies reporting only patient outcomes, such as ventilator-associated pneumonia incidence or mortality, without any description of the oral care delivered are excluded from the synthesis of delivery but are retained where they describe the oral care intervention received.

Additional criteria not defined by the PICOS elements.

Publication period. Literature published from 1 January 2015 onwards is eligible. This boundary is not arbitrary: international guidance on oral care for mechanically ventilated patients changed substantially during this period, most notably with the 2022 recommendation of routine toothbrushing and against routine chlorhexidine, so practice reported before 2015 describes a standard of care that no longer applies. Where a study reports data collected partly before this date but is published after it, the study is eligible and the reporting period is recorded.

Language. No language restriction is applied. Records in languages other than English are assessed with the assistance of machine translation, and key data fields for any study included on that basis are verified against the original text. This criterion is stated separately because language restrictions operate in the same way as design restrictions: they remove evidence unevenly, falling most heavily on studies published in regional journals outside English-speaking countries.

Publication type. Reviews, guidelines, editorials, commentaries and study protocols are not eligible as primary studies, although they may inform the background. Conference abstracts for which no complete data can be obtained are excluded from data synthesis but are counted and reported separately, so that the volume and distribution of incomplete reporting remains visible rather than disappearing from the flow diagram.

Availability of data. A study is excluded only if no description of the oral care delivered can be obtained after reasonable attempts to retrieve the full text, including interlibrary request where available. Studies reporting only patient outcomes, such as ventilator-associated pneumonia incidence or mortality, without any description of the oral care delivered are excluded from the synthesis of delivery but are retained where they describe the oral care intervention received.

Geographical and income criteria. No country or region is excluded, and no minimum number of study sites is required. Country income level is used as an analytical stratifier and is never applied as an eligibility criterion, so that studies remain eligible regardless of where they were conducted. Studies conducted in a single unit, in a single

hospital, in multiple hospitals, or across countries are all eligible.

Setting criteria beyond the intensive care unit. Only intensive care settings are eligible. General wards, long-term care facilities, nursing homes and home care are excluded. Within intensive care, no restriction is placed on unit type: general, surgical, medical, cardiac, neurological, paediatric and neonatal units are all eligible.

Information sources Information sources are searched in three tiers. The tiered structure is deliberate, because bibliographic indexes do not cover the world's nursing literature evenly. Journals published in high-income countries are indexed comprehensively and written in English; journals published elsewhere are indexed partially, if at all, and are more often published in other languages. A search restricted to mainstream databases would therefore under-represent the lower-income settings this review is concerned with, and would bias the comparison between income groups that the review exists to make.

The first tier comprises mainstream bibliographic databases: PubMed and Europe PMC.

The second tier comprises regional and open-access databases selected to reach literature that mainstream indexes under-represent: African Journals Online, the Directory of Open Access Journals, and the Eastern Africa Nursing and Midwifery Research Repository. Within the Directory of Open Access Journals, country-level searches are used so that a genuine absence of research in a region can be distinguished from a failure of the search to reach it. This tier proved material to the evidence base: the Directory of Open Access Journals contributed a substantial proportion of the included studies, and one included study was identified only through the Eastern Africa Nursing and Midwifery Research Repository.

Four sources could not be reached from the study setting during the search period: LILACS, the African Index Medicus, the Egyptian Knowledge Bank and Sabinet. This is reported as a limitation rather than left undisclosed. Country-level searches within the Directory of Open Access Journals were used in part to compensate for the coverage these sources would have provided, and the residual consequences for the geographical distribution of the included evidence are discussed explicitly, because an unreachable database and an empty literature are easily confused in a published review.

The third tier comprises grey literature and citation sources: OpenAlex, covering institutional repositories, preprint servers and dissertations; the Wits institutional repository; OSF Preprints; and

backward and forward citation tracking of every included study. Citation tracking is treated as a formal information source rather than an optional supplement, because it is the only mechanism that can recover studies whose indexing is poor but whose content is directly relevant. This tier identified studies from countries not represented in the first two tiers.

Scopus and CINAHL are not available to the review team without institutional subscription, and this is likewise reported as a limitation.

No language filter and no country filter is applied to any source. Country coverage is addressed through the tiered structure rather than a filter, so that studies remain eligible regardless of where they were conducted. The full strategy for every source, with the exact syntax used and the number of records retrieved from each, is provided as a supplementary file.

Main outcome(s) This is a scoping review, not an effectiveness review. No primary clinical endpoint is specified and no effect estimate is calculated. The outcomes of interest are descriptive characteristics of oral care delivery as reported in the included studies, in four categories.

The main outcome is reported oral care delivery, characterised along five dimensions: the solution and concentration used; the tool or method of application; the frequency and timing of oral care; the personnel who perform it; and whether a written protocol exists. Each dimension is charted and reported separately for each country income group. Reported delivery, adherence and compliance rates are included, each recorded with the measurement basis on which it was obtained.

The second category is reported barriers to and facilitators of oral care delivery, recorded in the terms used by the original authors and grouped by income group.

The third category is the characteristics of the evidence itself: the distribution of included studies by income group, country, patient age group and study design; the measurement approach used in each study, classified as direct observation, point prevalence or chart review, audit against evidence-based criteria, self-administered questionnaire, institutional-level reporting, or patient-level outcome; and the completeness of reporting. Incomplete reporting is treated as an outcome and quantified rather than described.

The fourth category is patient-level outcomes where reported alongside delivery data, including ventilator-associated pneumonia incidence, oral health status, and duration of ventilation or length of stay. These are charted to indicate which studies link delivery to patient consequences; they are not pooled or compared.

No outcome is pooled across studies and no statistical comparison between income groups is performed, because measurement bases differ and are themselves an object of analysis. Studies reporting only patient outcomes without any description of the oral care delivered are not eligible.

Additional outcome(s) Several items are charted that are not outcomes of the review in the clinical sense, but which are reported because they describe the evidence base and its limitations.

Study-level items: study design; setting and type of intensive care unit; single-centre or multicentre; country and World Bank income group; language of publication; and whether the study was peer reviewed or a dissertation.

Population-level items: sample size; whether the sample comprised patients or staff; the proportion of eligible participants who responded, where reported; and the patient age range and whether neonatal or paediatric patients were included.

Measurement-level items: whether the instrument or data collection method was validated; whether reliability was reported and by what method; whether the study defined the oral care procedure explicitly; and whether adherence was assessed against a predefined standard.

Reporting-level items: the completeness of reporting of each charted item, recorded as reported, not reported, or unclear; whether the study reported any deviation from its own protocol; and whether the study acknowledged limitations relating to measurement.

These items are not pooled, and no statistical comparison across income groups is performed on them. They are reported descriptively, by income group, and are used to characterise the strength and the limits of the available evidence. The completeness of reporting is quantified rather than described narratively, so that the extent of incomplete reporting can itself be reported as a finding.

Data management A structured extraction form is developed, piloted, and revised before use; the final form is provided as a supplementary file.

The following items are charted. Bibliographic: first author, year, digital object identifier, and language of publication. Contextual: country in which the study was conducted, and the corresponding World Bank income group. Country is charted as the country where the study was carried out, not the country of the publishing journal, because the two frequently differ. Design: study design, setting, type of unit, and whether single-centre or multicentre. Population: sample size, whether the sample comprised patients or staff, patient age

range, and whether neonatal or paediatric patients were included. Delivery: solutions and concentrations, tools, frequency, personnel, whether oral health was assessed and with which instrument, and whether a written protocol existed. Outcome: reported delivery, adherence or compliance rates, knowledge scores, and patient-level outcomes. Explanatory: barriers and facilitators, in the terms used by the authors.

Every reported rate is charted with its measurement basis, recorded as one of: direct observation; point prevalence or chart review; audit against evidence-based criteria; self-administered questionnaire; institutional-level reporting; or patient outcome. This field is mandatory, and a rate without an identifiable basis is recorded as such rather than assigned to a category. Rates with different bases are never pooled or averaged. Every charted data point is linked to its source study, so any value reported in the review can be traced to the study and page from which it was taken. Items not provided by the source report are recorded as not reported rather than left blank, so that completeness of reporting is itself quantifiable. Data are entered into a spreadsheet and retained by the corresponding author.

Quality assessment / Risk of bias analysis

Critical appraisal is undertaken using the JBI checklists appropriate to each included study design. This approach is used rather than a risk-of-bias instrument, and the reason is substantive rather than a matter of convenience.

Risk-of-bias instruments such as RoB 2 are designed to assess the internal validity of studies estimating the effect of an intervention on an outcome. Most studies in this review do not estimate an effect; they describe what oral care was delivered, what staff report doing, or what was documented. Applying an effect-estimation bias tool to a descriptive study would produce a judgement with no clear meaning, and could imply a precision the evidence does not support. Critical appraisal against design-specific JBI criteria instead allows the methodological quality of descriptive and observational studies to be characterised on their own terms.

The appraisal is reported in full as a supplementary file, with each criterion recorded as met, not met, unclear or not applicable. Studies are not excluded on the basis of appraisal results, because exclusion on quality grounds is not required by scoping review methodology and would remove evidence unevenly across income groups. Results are used analytically, to characterise the strength of the available evidence.

Two categories of records are appraised differently. Records available only as abstracts are not

appraised, because the information required is not reported; they are counted and reported separately so that the volume of incomplete reporting remains visible. Bibliographic-only records, including dissertations retrieved without accessible full text, are likewise not appraised and are reported separately.

The distribution of appraisal results is reported by country income group. Methodological quality is not evenly distributed across the evidence base: studies from lower-income settings are more likely to be small, single-centre, and reported with limited detail on instrument validation. Reporting this distribution allows the review to distinguish a genuine absence of evidence in a setting from the presence of evidence whose quality limits what can be concluded from it. Appraisal results are not used to weight findings, to produce a summary quality score, or to grade confidence in the synthesised results.

Strategy of data synthesis Results are synthesised descriptively rather than statistically. A meta-analysis is not planned, and this is a substantive decision rather than a limitation of the data. The included studies do not measure the same construct under the same label. A questionnaire records what staff report doing; direct observation records what was done during a sampled period; chart review records what was written down; an audit records conformity with a predefined standard; and institutional reporting records whether a protocol exists rather than whether it is followed. These are not interchangeable measurements of one quantity, and pooling them would produce an estimate with no clear interpretation. The synthesis is therefore organised by measurement basis and never aggregated across bases.

Findings are organised by World Bank income group. Within each group, results are reported by theme: solutions and concentrations; tools; frequency and timing; personnel; oral health assessment and the instrument used; documentation; reported delivery, adherence and compliance rates with their measurement bases; and reported barriers and facilitators. Where a theme is reported in more than one income group, findings are presented alongside each other. No statistical comparison between income groups is performed, and no claim of statistical significance is made. Differences are described as differences in what has been reported, not as established differences in practice.

Three analyses beyond simple tabulation are performed. The first maps the distribution of the available evidence by income group, country, patient age group and study design. Regions and

income groups from which no eligible study was identified are reported explicitly, and the review distinguishes throughout between evidence that is limited and evidence that appears to be absent.

The second analysis characterises the measurement approaches used, and examines whether their distribution differs across income groups. This is what makes the reported figures interpretable. If self-reported practice predominates in some income groups and direct observation in others, an apparent difference in adherence may reflect the instruments used rather than the care delivered. The review therefore reports the distribution of measurement approaches alongside the reported rates, and treats the measurement approach as a finding rather than a methodological footnote.

The third analysis characterises barriers and facilitators as reported in each income group, in the terms used by the original authors. Barriers are grouped by income group and are not combined into a single ranked list across groups, because the conditions they describe are not equivalent: a barrier reported in one setting may describe a constraint on the availability of supplies, while the same label in another setting may describe a constraint on institutional support or training.

Heterogeneity is characterised narratively rather than statistically, in terms of design, setting, population, measurement basis and the definitions used for key constructs. No summary quality score is produced, no weighting is applied, and confidence in the findings is not graded, because established grading tools are designed for reviews of effectiveness rather than for scoping reviews of descriptive evidence.

Subgroup analysis No statistical subgroup analysis is planned. There is no pooled estimate to subgroup, no interaction test is performed, and no subgroup finding is claimed to be statistically significant. The groupings described below are descriptive stratifications, used to organise how findings are reported rather than to test for differences between groups.

Four stratifications are pre-specified. The first and principal stratification is by World Bank income group: low-income, lower-middle-income, upper-middle-income and high-income countries. This is the stratification the review exists to make, and all findings are reported within it.

The second is by patient age group: neonatal, paediatric, adult, and mixed or unspecified. Age group is stratified because the evidence base is unevenly distributed across it, because neonatal oral care is delivered in a distinct setting with distinct requirements, and because age group may

be confounded with income group if paediatric and neonatal studies cluster in particular countries. The third is by measurement basis: direct observation, point prevalence or chart review, audit against evidence-based criteria, self-administered questionnaire, institutional-level reporting, and patient-level outcome. This stratification is the mechanism by which the comparability of reported rates is assessed, and it is reported alongside every rate rather than only in a separate section. The fourth is by study design, reported to show which questions the available designs can and cannot answer within each income group. Two limitations of the stratifications are reported. Where a stratum contains no eligible study, this is stated explicitly rather than left blank, so that empty strata are visible as findings. Where two included studies derive from the same sample or the same project, this is recorded, and the two are not presented as independent evidence within a stratum.

Sensitivity analysis No statistical sensitivity analysis is planned. There is no pooled estimate whose robustness to analytic assumptions could be tested, no choice of effect measure, no choice of meta-analytic model, and no study-level weight that could be varied. Reporting a sensitivity analysis in the conventional sense would therefore imply an analysis that is not being performed. Four checks on the robustness of the descriptive findings are pre-specified instead. The first concerns the effect of the principal inclusion decisions. The findings are examined with and without the studies available only as abstracts, and with and without studies appraised as methodologically weakest, in order to establish whether any theme or conclusion depends on records for which the underlying data are limited. These studies are not removed from the review; the comparison is reported so that the dependence of the findings on them is visible. The second concerns the effect of excluding records that could not be retrieved in full text. The number and geographical distribution of such records are reported, and the review states explicitly whether their exclusion could plausibly alter any income-group finding, rather than asserting that it could not. The third concerns the effect of the measurement-basis stratification. Reported rates are examined within each measurement basis separately, and the review reports whether the direction of any income-group difference changes when the comparison is restricted to studies using the same measurement basis. Where it does change, this is reported as a finding rather than treated as a problem to be resolved.

The fourth concerns possible duplication of samples. Where two included studies derive from the same sample, project or institution, the review reports whether treating them as independent would alter any reported count or pattern, and presents the affected counts both ways. None of these checks alters the eligibility criteria or the search strategy. They are reported in full, and any instance in which a finding is sensitive to one of them is stated explicitly in the results.

Language restriction No language restriction is applied. Records in languages other than English are assessed with the assistance of machine translation, with key data fields verified against the original text.

Country(ies) involved China. The review is conducted at Yangchun People's Hospital, Yangchun, Guangdong Province, China. All authors are affiliated with this institution.

Other relevant information This protocol is registered retrospectively. Preliminary searches had been undertaken before registration in order to assess the volume and feasibility of the review, and formal screening of the search results had also been completed. This is stated openly in accordance with the transparency-oriented approach to retrospectively registered protocols proposed by Canellas and Borges (Systematic Reviews 2026; doi:10.1186/s13643-026-03278-8). To preserve transparency, four things are reported. First, the exact date on which each search was executed is recorded, together with the number of records retrieved from each source, so that the interval between searching and registration is a matter of record rather than inference. Second, the reason for delayed registration is stated: registration was not initially planned, and the relevant platform, together with several of the regional databases used in the search, became reachable from the study setting only after the review had begun. Third, any deviation between this protocol and the final published report will be documented in that report rather than left for readers to detect; the protocol is written to describe what was done, not what would ideally have been planned. Fourth, the review is reported in full accordance with the PRISMA-ScR checklist, and the completed checklist is provided as a supplementary file, so that adherence to the reporting standard can be verified item by item. The review is conducted in accordance with JBI methodology for scoping reviews. The eligibility criteria, search strategy, charting fields and synthesis approach set out in this protocol describe the review as it was carried out. Where a

decision was made during the review that is not foreseen here, it is reported in the published article together with the reason for it.

Two limitations arising from the timing of registration should be stated explicitly. First, because screening had already been completed when this protocol was registered, the eligibility criteria cannot be regarded as having been fixed independently of the records to which they were applied. The criteria themselves were specified before screening began and were not modified during it, but readers should weigh the criteria with this in mind. Second, because the review question was refined in the light of the preliminary search, the questions stated here reflect the review as it was designed rather than a hypothesis specified in advance of all contact with the literature. The review is accordingly descriptive and hypothesis-generating rather than confirmatory.

Keywords oral care; oral hygiene; mechanical ventilation; intensive care unit; ventilator-associated pneumonia; scoping review; country income levels; health disparities.

Dissemination plans The completed review will be submitted for publication in a peer-reviewed journal indexed in PubMed, with Intensive and Critical Care Nursing identified as a target journal on the basis of its scope and its recent publication of related syntheses on oral care for mechanically ventilated patients. The manuscript will be reported in accordance with the PRISMA-ScR checklist, and the completed checklist will be submitted as a supplementary file.

The full search strategy for every source, the data extraction form, the completed critical appraisal, and the table of characteristics of all included studies will be provided as supplementary files alongside the published article, so that the searches and the charting decisions can be examined and reproduced.

Findings will also be presented at national or regional nursing conferences in China, and will be disseminated to the clinical staff of the intensive care unit in which the review was conducted, in the form of a short internal summary. This local dissemination is included deliberately: the review identifies unit-level conditions, such as the presence of a written protocol and the availability of supplies, that are directly actionable at the level of the unit, and reporting back to the participating setting is treated as part of the review's purpose rather than as an afterthought.

The final dataset of charted study characteristics will be made available from the corresponding author on reasonable request, with the caveat that

some charted items derive from copyrighted full texts and cannot be redistributed in full. No results will be disseminated.

Contributions of each author

Author 1 - Zihao Song.

Email: 1214655790@qq.com