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**Associations of DRG-Based Payment Reforms With
Hospitalization Costs and Length of Stay: A
Systematic Review and Meta-Analysis**

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ADMINISTRATIVE INFORMATION

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

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 14 September 2026 and was last updated on 14 September 2026.

INTRODUCTION

Review question / Objective Objective: To systematically evaluate the associations of diagnosis-related group (DRG)-based payment reforms with hospitalization costs and length of stay (LOS) among hospitalized patients.

PICOS:
Population: Hospitalized patients or inpatient admissions/episodes.
Intervention: DRG-based payment or reimbursement systems.
Comparator: Pre-reform periods, fee-for-service or other payment arrangements, concurrent comparison groups, or counterfactual trends, depending on study design.
Outcomes: Hospitalization costs and/or LOS.
Study designs: Quantitative studies capable of assessing changes associated with DRG payment reform, including difference-in-differences, interrupted time series, controlled observational

comparisons, controlled before-and-after studies, and adjusted before-and-after analyses.

The review also aimed to synthesize evidence separately according to study design, policy-effect estimand, outcome definition, and effect scale, and to avoid pooling methodologically incompatible estimates.

Rationale Diagnosis-related group (DRG)-based payment reforms have been widely implemented to improve hospital efficiency, contain healthcare expenditure, and modify provider incentives. However, existing evaluations vary substantially in study design, patient population, policy context, outcome definition, and analytical approach. Previous evidence has suggested possible reductions in hospitalization costs and length of stay (LOS), but findings remain heterogeneous and the certainty of evidence is limited. In particular, crude before-and-after comparisons, difference-in-differences (DID) studies, and interrupted time

series (ITS) studies estimate different policy effects and should not necessarily be pooled together. This review therefore aimed to provide an updated synthesis of DRG-based payment reforms while explicitly accounting for differences in study design, policy-effect estimand, outcome definition, and effect scale. Quantitative pooling was restricted to methodologically comparable estimates, while other eligible studies were summarized narratively.

Condition being studied The review concerns DRG-based hospital payment and reimbursement reforms rather than a specific disease. DRG systems classify inpatient cases into clinically and resource-similar groups and link reimbursement to these classifications. The review evaluates how implementation of DRG-based payment reforms is associated with hospitalization costs and length of stay among hospitalized patients across different clinical populations and healthcare settings.

METHODS

Search strategy PubMed, Web of Science, Embase, the Cochrane Library, and the China National Knowledge Infrastructure (CNKI) were searched for studies published between January 1, 2000 and May 30, 2026. Eligible publications were restricted to English or Chinese.

The search combined terms related to DRG/case-based payment, hospitalization costs/health expenditure/length of stay, and provider payment arrangements. Examples of English-language terms included: “Diagnosis-Related Groups,” “Diagnosis Related Group*,” “Case-based payment,” “Prospective Payment System,” “Bundled payment,” “hospital cost,” “medical cost,” “health expenditure,” “length of stay,” “hospital stay,” “Fee-for-service,” “payment system,” and “healthcare financing.”

The CNKI search included Chinese terms related to case-based payment, disease-based payment, DRG, hospitalization costs, medical expenditure, length of stay, payment methods, and fee-for-service. Search syntax was adapted to the indexing structure of each database. All retrieved records were imported into EndNote and duplicates were removed before screening.

Participant or population Hospitalized patients or inpatient admissions/episodes receiving care under healthcare systems in which a DRG-based payment or reimbursement reform was implemented. No restriction was imposed on specific disease category, age group, or hospital

specialty, provided that the study population represented hospitalized patients or inpatient admissions/episodes.

Intervention Implementation of a diagnosis-related group (DRG)-based payment or reimbursement system for inpatient care. Eligible interventions included national, regional, hospital-level, or insurance-based DRG payment reforms, including country-specific DRG variants such as SwissDRG, CHS-DRG, C-DRG, and DRG point-payment systems, provided that the intervention was fundamentally DRG-based.

Comparator Comparators varied according to study design and included pre-reform periods, fee-for-service or other payment arrangements, concurrent untreated or differently reimbursed patient groups, and counterfactual trends estimated within interrupted time series analyses.

Study designs to be included Quantitative studies permitting assessment of changes associated with DRG payment reform, including difference-in-differences, interrupted time series, controlled observational comparisons, controlled before-and-after studies, and adjusted before-and-after analyses.

Eligibility criteria Studies were included if they: (1) involved hospitalized patients or inpatient admissions/episodes; (2) evaluated a DRG-based payment or reimbursement system; (3) used a quantitative design permitting an identifiable comparison across intervention periods, groups, or payment arrangements; (4) reported hospitalization costs and/or length of stay with sufficient quantitative information for extraction; and (5) were original full-text articles published in English or Chinese.

Studies were excluded if they were reviews, commentaries, editorials, conference abstracts, or other incomplete reports; did not permit an identifiable quantitative comparison; did not report or permit extraction of hospitalization costs or LOS; or were based exclusively on aggregate regional or institutional indicators without a defined hospitalized-patient or inpatient-admission study population. DIP-only payment studies were outside the clarified DRG-specific intervention scope.

Information sources Electronic information sources included PubMed, Web of Science, Embase, the Cochrane Library, and CNKI. Searches covered publications from January 1, 2000 to May 30, 2026. The review did not rely on trial registries or unpublished grey-literature

databases as primary information sources. Full-text reports identified through database searching were assessed for eligibility.

Main outcome(s) The primary outcomes were hospitalization costs and length of stay (LOS). For DID studies, adjusted treatment-by-period interaction coefficients or equivalent adjusted DID contrasts were extracted. For ITS studies, immediate level changes and post-intervention slope changes were extracted and analyzed separately. Effect measures included log-scale or proportional changes and absolute changes in currency units or days, depending on the original study. Where otherwise comparable ITS slope estimates used different fixed time units, estimates and corresponding standard errors were rescaled to a common monthly unit. Outcomes were evaluated over the pre- and post-reform periods defined in the original studies.

Additional outcome(s) No additional outcomes were prespecified for quantitative synthesis. The review focused on hospitalization costs and length of stay.

Data management All retrieved records were imported into EndNote and duplicates were removed. Two reviewers independently screened titles and abstracts and subsequently assessed potentially eligible full-text reports. Disagreements were resolved through discussion, with consultation of a third reviewer when necessary. Data were independently extracted using a predefined standardized extraction form. Extracted items included author, year, country/region, study population, sample size, payment reform characteristics, study design, intervention timing, comparator, outcome definitions, effect measures, statistical models, adjustment variables, and policy-effect estimates. Study design classifications and extracted policy-effect estimates were verified against the original reports.

Quality assessment / Risk of bias analysis Risk of bias was assessed independently by two reviewers using the Risk Of Bias In Non-randomized Studies of Interventions (ROBINS-I) tool. Seven domains were considered: confounding, selection of participants, classification of interventions, deviations from intended interventions, missing data, measurement of outcomes, and selection of the reported result. Design-specific issues were also considered. For DID studies, particular attention was given to comparator validity, pre-intervention parallel trends, and concurrent policy changes. For ITS studies, the number and spacing of observations,

intervention timing, underlying trends, autocorrelation, concurrent interventions, and availability of an unaffected control were considered. Missing-data bias was rated as “No information” when the primary report did not provide sufficient information to support a defensible judgment.

Strategy of data synthesis Eligible studies were first classified according to study design, outcome domain, policy-effect estimand, and effect scale. Quantitative pooling was performed only when studies shared the same analytical design (e.g., DID or ITS), outcome domain (hospitalization cost or LOS), policy-effect estimand (e.g., treatment-by-period interaction, immediate level change, or post-intervention slope change), and compatible effect scale. DID and ITS estimates were synthesized separately. ITS immediate level changes and slope changes were treated as distinct estimands, and absolute and relative effect scales were not combined.

Random-effects meta-analyses were conducted using restricted maximum likelihood (REML) estimation in R using the metafor package. Pooled estimates were reported with 95% confidence intervals. Heterogeneity was assessed using Cochran’s Q , I^2 , and between-study variance (τ^2). Prediction intervals were calculated when considered meaningful. Studies that were eligible for the systematic review but lacked a compatible adjusted policy-effect estimate were retained for narrative synthesis rather than pooled.

Subgroup analysis No formal subgroup meta-analysis was performed because too few methodologically comparable studies were available. Evidence was instead stratified by study design, outcome domain, policy-effect estimand, and effect scale. DID and ITS studies were analyzed separately, and ITS immediate level and slope changes were treated as separate estimands.

Sensitivity analysis Leave-one-out sensitivity analyses were conducted for quantitative syntheses including at least three studies to assess the influence of individual studies on pooled estimates and heterogeneity. Given the very small number of studies contributing to each meta-analysis, a modified Knapp–Hartung small-sample adjustment was additionally applied as a sensitivity analysis while retaining REML random-effects models as the primary analyses. The variance adjustment factor was constrained to be no smaller than 1 to avoid confidence intervals

narrower than those from the conventional random-effects model.

Language restriction Yes. Studies published in English or Chinese were eligible.

Country(ies) involved China.

Other relevant information This registration is retrospective. The review question, core eligibility criteria, and primary outcomes (hospitalization costs and LOS) were established before data extraction. However, during detailed reassessment of the original reports and subsequent peer review, the analytical approach was refined to classify studies by design, re-extract adjusted policy-effect estimates, separate DID from ITS studies, distinguish ITS immediate level changes from post-intervention slope changes, and restrict pooling according to policy-effect estimand and effect scale. These refinements were introduced to avoid pooling methodologically incompatible estimates.

The review was not prospectively registered because protocol registration was not planned at study inception. By the time registration was considered, the review process had already commenced. No publicly archived prospective protocol was available.

Keywords diagnosis-related groups; DRG-based payment; hospitalization costs; length of stay; difference-in-differences; interrupted time series; provider payment reform; healthcare financing.

Dissemination plans The findings will be disseminated through publication in a peer-reviewed scientific journal. Where appropriate, the results may also be presented at academic or professional conferences. The completed review will be reported in accordance with the PRISMA 2020 statement.

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