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ICU Registries as Core Infrastructure for Pandemic Preparedness: A Scoping Review Protocol

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ADMINISTRATIVE INFORMATION

Support - This review received no dedicated funding. Pontificia Universidad Católica de Chile provided access to library resources and databases required for the search strategy.

Review Stage at time of this submission - Preliminary searches.

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 15 June 2026 and was last updated on 15 June 2026.

INTRODUCTION

Review question / Objective Review question
What is the available evidence on the role of ICU registries and data platforms in supporting pandemic preparedness and surge capacity in critical care systems?
Sub-questions
• How have ICU registries and data platforms been used for real-time surveillance and situational awareness during pandemics?
• How have these systems supported surge capacity management and operational coordination?
• How have ICU registries functioned as research infrastructure during pandemics?
• What role have registries played in benchmarking and quality improvement?
• What barriers and gaps have been reported in relation to interoperability, governance, and integration into health systems?
Objective
To map and characterize the available evidence on the role of ICU registries and data platforms as core infrastructure for pandemic preparedness, focusing on their contribution to real-time situational awareness, operational decision-making, surge capacity management, research readiness, and system learning in critical care.

Rationale The COVID-19 pandemic exposed critical limitations in health system preparedness, particularly in intensive care. Pandemic response has traditionally focused on expanding physical capacity—ICU beds, equipment, and workforce—while the role of data infrastructure in supporting timely and effective decision-making has received comparatively less attention.
ICU registries and clinical data platforms have historically been developed to support audit, benchmarking, quality improvement, and research. During the pandemic, these systems were rapidly adapted or repurposed to enable real-time surveillance, monitor resource utilization, support inter-hospital coordination, and facilitate large-

scale research collaborations. This evolution suggests a shift in the conceptualization of ICU registries—from passive data repositories to active components of health system operations, potentially serving as core infrastructure for resilience, coordination, and learning in critical care systems.

The available literature on this topic is heterogeneous, spanning clinical, operational, and research domains, and is dispersed across different bodies of evidence. To date, no systematic or scoping reviews appear to have synthesized this evidence specifically around the role of ICU registries and data platforms as infrastructure for pandemic preparedness and surge capacity. A scoping review is therefore an appropriate approach to map the extent and nature of the available evidence, identify key concepts and functions attributed to these systems, and characterize gaps in interoperability, governance, and integration into health systems—informing both future research and pandemic preparedness planning.

Condition being studied This scoping review focuses on the role of intensive care unit (ICU) registries and clinical data platforms as core infrastructure for pandemic preparedness and response in critical care systems.

ICU registries are structured systems for collecting standardized clinical, operational, or outcome data from critically ill patients. They have traditionally supported clinical audit, benchmarking, quality improvement, and research. The "condition" of interest in this review is not a specific disease, but rather the operational and informational state of critical care systems during pandemics and large-scale infectious disease outbreaks (e.g., COVID-19), characterized by surges in patient volume, resource constraints, and the need for rapid situational awareness and coordinated decision-making.

The review considers adult, pediatric, or mixed ICU populations, as well as hospital networks and regional or national critical care systems, in relation to how registry-derived data have been used—or could be used—to support real-time surveillance, surge capacity management, research readiness, and system-level learning during periods of high demand on critical care services.

METHODS

Search strategy A three-step search strategy will be used, in accordance with JBI methodology for scoping reviews. First, an initial limited search of PubMed/MEDLINE will be undertaken to identify articles on the topic. Second, the text words contained in the titles and abstracts of relevant articles, together with the index terms used to describe them, will be used to develop a comprehensive search strategy adapted to each of the following databases: PubMed/MEDLINE, Scopus, and Embase. Third, the reference lists of all included sources of evidence will be screened to identify additional relevant studies.

Timeframe: Studies published from January 2009 to the date of the final search will be included. The start date of January 2009 was selected because it corresponds to the global emergence of the H1N1/COVID-19 pandemic, the period during which ICU registries and clinical data platforms were most extensively adapted or repurposed to support pandemic response, surveillance, and surge capacity management.

Language limits: Studies published in English and Spanish will be considered, balancing comprehensiveness with feasibility of full-text screening by the review team.

Search terms (draft PubMed strategy):

(("Intensive Care Units"[Mesh] OR intensive care unit* OR ICU OR critical care)
AND
(registr* OR registry OR registries OR "data platform*" OR dashboard* OR "clinical database*" OR "data infrastructure" OR surveillance system*)
AND
(pandemic* OR H1N1 OR COVID-19 OR SARS-CoV-2 OR "health emergency")

AND
("surge capacity" OR preparedness OR resilience OR "situational awareness" OR "resource allocation" OR coordination OR benchmarking OR "quality improvement"))

This strategy will be adapted to the specific syntax, controlled vocabulary (e.g., Emtree for Embase), and indexing conventions of each database.

Selection process: All identified citations will be collated and imported into reference management software, and duplicates will be removed. Titles and abstracts will be independently screened by two reviewers against the inclusion criteria. Potentially relevant sources will be retrieved in full and assessed in detail by two independent reviewers. Disagreements at any stage will be resolved through discussion or consultation with a third reviewer. The study selection process will be reported using a PRISMA-ScR flow diagram.

Participant or population This scoping review will consider evidence involving adult, pediatric, or mixed intensive care unit (ICU) populations. The unit of analysis may extend beyond individual patients to include ICUs, hospital networks, and

regional or national critical care systems as a whole.
In addition to patient populations, the review will consider evidence involving clinicians, managers, policymakers, or researchers who interact with ICU registry data—for example, in the context of surveillance, surge capacity planning, governance, or research use of registry-derived information.

Intervention This scoping review does not evaluate a clinical intervention in the traditional sense (e.g., a treatment, drug, or program tested against a comparator). Instead, the "intervention" of interest corresponds to the use, adaptation, or implementation of ICU registries and clinical data platforms as infrastructure during pandemics and large-scale infectious disease outbreaks.
Specifically, the review will map evidence on how these systems have been used or repurposed for: real-time surveillance and situational awareness; surge capacity management and operational coordination; research infrastructure during pandemics; and benchmarking and quality improvement. No comparator intervention is defined, as the aim is to describe and characterize the existing evidence rather than to evaluate effectiveness.

Comparator Not applicable. As this is a scoping review aiming to map and characterize the available evidence rather than to evaluate effectiveness, no comparator intervention is defined. Studies will not be excluded based on the presence or absence of a comparison group; descriptive studies, registry descriptions, implementation studies, and other relevant source types (as defined in the inclusion criteria) will be considered regardless of comparative design.

Study designs to be included Observational studies, implementation studies, registry descriptions, modeling studies, methodological studies, quality improvement reports, mixed-methods studies, and relevant institutional/organizational reports. Editorials, opinion pieces without primary data, and conference abstracts lacking sufficient methodological detail will be excluded.

Eligibility criteria Studies must address ICU registries, critical care registries, ICU data platforms, dashboards linked to registry infrastructure, or surveillance systems using ICU data, defined as structured systems for collecting standardized clinical, operational, or outcome data in critical care settings.
Eligible studies must situate this evidence within the context of pandemics, large-scale infectious disease outbreaks, pandemic preparedness, or surge capacity/emergency response in critical care.
Studies will be excluded if they are unrelated to ICU registries or to a pandemic/surge context, even if they otherwise meet the population or design criteria.
Only studies published in English or Spanish, from January 2009 onward, will be considered.

Information sources The following electronic databases will be searched as the primary information sources: PubMed/MEDLINE, Scopus, and Embase.
In addition to the database searches, the reference lists of all included sources of evidence will be screened to identify additional relevant studies that may not have been captured by the electronic search.
A preliminary/limited search of PubMed was conducted during protocol development to identify relevant articles and inform the development of the full search strategy, including the selection of keywords and index terms.
This review does not currently plan a systematic search of grey literature sources (e.g., conference proceedings, institutional reports, trial registers, or preprint servers) beyond what is captured through the three databases above and citation chaining via reference lists. However, relevant institutional or organizational reports identified through these means, or through reference list screening, will be eligible for inclusion if they meet the eligibility criteria.
Direct contact with study authors is not planned as a primary search strategy, but may be considered on a case-by-case basis if data extraction from an otherwise eligible source requires clarification or missing information.

Main outcome(s) As this is a scoping review, no effect measures (e.g., risk ratios, mean differences) will be calculated, and no timing of outcome assessment applies in the traditional sense. Instead, the review will map and characterize the following key elements from included sources:
The role of ICU registries and data platforms in real-time surveillance and situational awareness during pandemics; their contribution to surge capacity management and operational coordination; their function as research infrastructure during pandemics; their role in benchmarking and quality improvement; and barriers, gaps, and limitations related to interoperability, governance, and integration into health systems.
For each included source, data will also be charted on registry/platform type, purpose, data

characteristics, reporting frequency, and pandemic context (e.g., COVID-19, H1N1).
Findings will be presented in tabular and narrative form, organized thematically across these domains, in order to describe the extent, range, and nature of available evidence rather than to assess effectiveness.

Data management All citations identified through the database searches will be exported and collated into reference management software Mendeley, where duplicates will be removed prior to screening.
Titles and abstracts will be screened independently by two reviewers against the eligibility criteria using the same software/platform. Potentially relevant sources will be retrieved in full text and uploaded for full-text assessment, also conducted independently by two reviewers. Any disagreements at the screening or full-text stage will be resolved through discussion, or by consultation with a third reviewer.
Data from included sources will be extracted using a standardized charting form (Microsoft Excel or equivalent spreadsheet software), developed by the review team and piloted on a subset of included studies before full implementation. The charting form will be iteratively refined as needed during the extraction process, with any modifications documented and reported in the final review.
Extracted data will be stored in a shared, version-controlled spreadsheet accessible to all reviewers, with periodic backups. The results of the search and selection process will be documented and reported using a PRISMA-ScR flow diagram.

Quality assessment / Risk of bias analysis In accordance with JBI methodology for scoping reviews, formal quality assessment or risk of bias analysis of included sources of evidence will not be conducted. This is consistent with the purpose of a scoping review, which is to map the extent, range, and nature of available evidence and to identify key concepts, sources, and gaps in the literature—rather than to evaluate the methodological quality of individual studies or to synthesize effect estimates.
Excluding formal critical appraisal allows the review to include a broad range of source types (e.g., observational studies, registry descriptions, modeling studies, implementation reports, and institutional reports), which is appropriate given the heterogeneous and largely descriptive nature of the literature on ICU registries and data platforms in pandemic contexts.

Strategy of data synthesis Extracted data will be analyzed using a combination of descriptive numerical summary and qualitative thematic analysis, consistent with JBI methodology for scoping reviews. No statistical pooling or meta-analysis will be undertaken, as the objective is to map and characterize the evidence rather than to assess effectiveness.
Descriptive analysis will summarize key characteristics of included sources—such as year of publication, country/region, study design or source type, pandemic context (e.g., COVID-19, H1N1), setting (single center, multicenter, national, international), and type of ICU registry or platform—presented in tabular and/or graphical form (e.g., summary tables, frequency counts).
A thematic analysis will then be conducted to map how ICU registries and data platforms have functioned across the following pre-defined domains, derived directly from the review's sub-questions:

Real-time surveillance and situational awareness
Surge capacity management and operational coordination
Registries as research infrastructure
Benchmarking and quality improvement
Cross-cutting challenges and gaps (e.g., interoperability, governance, integration into health systems)

For each domain, findings from included sources will be grouped and synthesized narratively, highlighting recurring functions, reported barriers, and gaps in the evidence. A narrative summary will accompany the tabulated/charted results, describing how the findings relate to the review's objective and sub-questions.
Any deviations from this planned approach to data synthesis will be documented and justified in the final scoping review.

Subgroup analysis As this is a scoping review, no statistical subgroup analyses (e.g., stratified effect estimates) will be conducted, since no effect measures are calculated.
However, where relevant and feasible, extracted data may be descriptively grouped or stratified to explore patterns across the mapped evidence—for example, by pandemic context (COVID-19 vs. H1N1 or other outbreaks), setting (single center, multicenter, national, or international), type of ICU registry or platform (e.g., clinical registry, operational dashboard, surveillance system), or population (adult, pediatric, or mixed ICU populations).
These groupings, if used, will be descriptive and exploratory in nature, intended to support the

narrative synthesis and highlight whether certain functions, barriers, or gaps appear more prominently within specific contexts. Any such groupings will be reported transparently in the final scoping review, including the rationale for their use.

Sensitivity analysis As this is a scoping review that does not involve effect estimates, pooled results, or statistical synthesis, no formal sensitivity analysis (e.g., re-running analyses while excluding studies of lower methodological quality) will be conducted, consistent with the exclusion of formal quality appraisal described above.
As a methodological safeguard, the draft data extraction (charting) form will be piloted on a subset of included sources by the review team prior to full implementation, to ensure consistency in how data are interpreted and recorded. Any modifications made to the charting form during this process, or during data extraction more broadly, will be documented and reported transparently in the final scoping review, along with their rationale.
Additionally, any disagreements between reviewers during study selection or data extraction will be resolved through discussion or, where necessary, consultation with a third reviewer, helping to ensure the robustness and consistency of the mapped findings.

Language restriction Yes. Only studies published in English or Spanish will be considered, to balance comprehensiveness with feasibility of full-text screening by the review team.

Country(ies) involved Chile (all authors).

Keywords critical care; data infrastructure; pandemic preparedness; registries; surge capacity.

Dissemination plans Findings from this scoping review will be disseminated through publication in a peer-reviewed journal and through presentations at relevant scientific conferences in critical care, health systems research, or pandemic preparedness.
The protocol will be registered on an open-access platform (INPLASY/OSF) prior to commencing the review, and any deviations from the registered protocol will be reported and justified in the final manuscript.
No additional dissemination activities (e.g., policy briefs, stakeholder workshops) are currently planned, but findings may be shared informally with relevant institutional stakeholders involved in critical care registry governance, where appropriate.

Contributions of each author

Author 1 - Magdalena Vera - Author 1 — Magdalena Vera: Conceived and designed the review protocol, developed the search strategy, and drafted the manuscript. Will coordinate the review process and contribute to data synthesis and interpretation.
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Author 2 - Maximiliano Rovegno - Author 2 — Maximiliano Rovegno: Critically reviewed and revised the protocol, will act as third reviewer to resolve disagreements during study selection and data extraction, and provided overall supervision of the project.
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