**Pediatric Chronic Critical Illness: A Protocol for a Scoping Review**

Preferred Reporting Items for Systematic review and Meta-Analysis extension for Scoping Reviews (PRISMA-ScR) checklist (1)

| Section/Topic | Checklist Item | Protocol Information |
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| **Administrative Information** | | |
| Title | | |
| Identification | Scoping review title | Pediatric Chronic Critical Illness: A Protocol for a Scoping Review |
| Authors | | |
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| Contributions | Describe contributions of protocol authors and identify the guarantor of the review | **Zorko**<br>✓ Conceptualization ✓ Methodology ✓ Validation ✓ Investigation ✓ Data curation ✓ Writing 1st draft ✓ Revising and editing ✓ Visualization ✓ Project administration<br><br>**Choong**<br>✓ Conceptualization ✓ Methodology ✓ Validation ✓ Investigation ✓ Data curation ✓ Revising and editing ✓ Visualization ✓ Supervision ✓ Project administration ✓ Guarantor |

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| | | **McNally**<br>✓ Methodology ✓ Validation ✓ Investigation ✓ Data curation ✓ Revising and editing ✓ Visualization ✓ Supervision<br><br>**Rochwerg**<br>✓ Methodology ✓ Validation ✓ Investigation ✓ Data curation ✓ Revising and editing ✓ Visualization ✓ Supervision<br><br>**Pinto**<br>✓ Methodology ✓ Validation ✓ Investigation ✓ Data curation ✓ Revising and editing ✓ Visualization ✓ Supervision<br><br>**Couban**<br>✓ Methodology ✓ Investigation ✓ Data curation ✓ Revising and editing ✓ Visualization<br><br>**O'Hearn**<br>✓ Methodology ✓ Validation ✓ Investigation ✓ Data curation ✓ Revising and editing ✓ Visualization |
| Amendments | If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments | The protocol will be uploaded as a pre-print to Open Science Framework (OSF). Protocol amendments will be documented in OSF with date, description, and rationale. |
| **Introduction** | | |
| Rationale | Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach. | Due to improvements in the delivery of intensive care, survival of even the most critically ill of children has increased, leading to a growing proportion of children with chronic and/or complex medical conditions in the pediatric intensive care unit (PICU) (2, 3). Some of these children are at significant risk of recurrent critical illness and persistent long-term morbidity, and become 'superusers' of PICU resources (4-8). These children are increasingly recognized as a unique high-risk population in the PICU referred to as children with chronic critical illness (CCI) (2, 5).<br><br>To date, this population has been understudied, in part due to pediatric CCI being a novel concept without an accepted definition to consistently identify these children. However, the limited research to date using variable definitions suggests both the prevalence of children with CCI to be increasing and significant impaired functional recovery in these patient populations after critical illness; these convergent and complex issues place significant strain on both the healthcare system and caregivers (2, 9). It has been proposed that prolonged PICU admissions are important qualifiers for pediatric CCI (2).<br><br>The literature addressing pediatric CCI is likely to be heterogeneous and complex. This scoping review is the first |

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| | | step in the development of a consensus case definition for pediatric CCI. This comprehensive literature review will seek to first evaluate existing or suggested definitions of pediatric CCI, and in their absence, identify key terms and constructs to inform the development of a working definition of pediatric CCI for future research. By informing the development of a consensus case definition for pediatric CCI, this research is foundational to describing the risk factors, long-term outcomes, quality of life and resource allocation implications of this high-risk PICU population. |
| Objectives | Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives. | The proposed scoping review will answer the following questions:<br>1. How is pediatric CCI defined in the current literature? Given the relative novelty of the term "chronic critical illness," this scoping review will also evaluate how prolonged PICU admissions have been defined.<br>2. What are the demographic and clinical characteristics of children with CCI based on existing definitions?<br>3. What are the nature and extent of outcomes studied in these patient populations?<br><br>The secondary aims are to describe in these defined populations (where possible):<br>4. The methodology used to develop and/or validate any existing definition of pediatric CCI<br>5. The prevalence of CCI in the PICU based on existing definitions |
| **Methods** | | |
| Protocol and Registration | Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number. | This is an original scoping review. The protocol was uploaded as a pre-print to Open Science Framework (OSF) on February 1, 2021. |
| Eligibility criteria | Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale. | **Population**: Studies that evaluated critically ill children (i.e., <18 years old) admitted to any PICU, identified with either:<br>1. Pediatric "chronic critical illness," or;<br>2. Prolonged or long-stay PICU admission.<br>We will exclude records if they: 1. did not include a definition of prolonged/long-stay PICU admission or CCI, as applicable to the study (e.g., as an inclusion criterion in a trial or as a case definition in a prevalence study); 2. evaluated adult or neonatal ICU populations only, or evaluate adults and children but do not report separate data for each population, or; 3. evaluated level 2 units or chronic ventilator/respiratory units.<br><br>**Intervention, Comparator, Outcome**: Any or none<br><br>**Publication Characteristics**: We will include observational and experimental studies, qualitative studies, and protocols that provide a working definition of prolonged/long-stay |

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| | | PICU admission or pediatric CCI. We will exclude editorial reviews, narrative reviews, grey literature, commentaries, opinion pieces, conference proceedings, abstracts, and books. Given the emerging nature of pediatric CCI, records prior to 1990 will be excluded. We will also exclude studies that were not published in English or French, for feasibility. |
| Information sources | Describe all intended information sources (e.g., electronic databases, contact with study authors, trial registers, or other grey literature sources) with planned dates of coverage | The following databases will be searched by a health sciences librarian (RC): Ovid Medline, Embase, CINAHL, and Web of Science. The search strategy will be designed and piloted in consultation with a health research librarian (RC). An iterative approach will be used in order to evaluate and refine the search strategy. A preliminary search strategy was developed in Medline and CINAHL (see section on *Search strategy*). Members of the investigative team will independently screen a set of 100 citations randomly selected from the full set, discuss discrepancies, and refine the search strategy by reviewing reference lists of included studies and identifying any relevant studies that evaded the database search (see section on *Selection of sources of evidence*). The final search strategy will be developed in Medline, peer-reviewed by a health research librarian not involved in the study, and then translated into the other databases, as appropriate. All databases will be searched from their dates of inception to February 1, 2021. We will also review the reference lists of included studies to identify any studies that may have evaded the database search. |
| Search strategy | Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated | **Preliminary Search Strategy**<br>**a) Medline**<br>1. ((p?ediatric* or child or children*) adj3 (chronic* or persist* or long term or longterm or prolong* or protract* or extend* or extensive or lengthy or difficult* or ((long or duration) adj3 stay)) adj3 (acute* or critical* or intens* or ill or illness* or sick or sickness* or care)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]<br>2. Intensive care units, Pediatric/<br>3. PICU.mp.<br>4. ((p?ediatric* or child or children*) adj3 (acute* or critical* or intens*)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]<br>5. or/2-4<br>6. exp Critical Care/<br>7. Critical Illness/<br>8. "Length of Stay"/<br>9. exp Chronic Disease/<br>10. ((chronic* or persist* or long term or longterm or prolong* or protract* or extend* or extensive or lengthy |

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| | | or difficult*) adj3 (acute* or critical* or intens* or ill or illness* or sick or sickness* or care)).mp.<br>11. ((length or hospital) adj3 stay).mp.<br>12. ((chronic* or persist* or long term or longterm or prolong* or protract* or extend* or extensive or lengthy or difficult*) adj3 (acute* or critical* or intens* or ill or illness* or sick or sickness* or care or disease)).mp.<br>13. or/6-12<br>14. 5 and 13<br>15. 1 and 14<br><br>**b) CINAHL**<br>1. TX ((p?ediatric* or child or children*) N3 (chronic* or persist* or long term or longterm or prolong* or protract* or extend* or extensive or lengthy or difficult*) N3 (acute* or critical* or intens* or ill or illness* or sick or sickness* or care))<br>2. (MH "Intensive Care Units, Pediatric")<br>3. TX PICU<br>4. TX ((p?ediatric* or child or children*) N3 (acute* or critical* or intens*))<br>5. 2 or 3 or 4<br>6. (MH "Critical Care")<br>7. (MH "Critical Illness")<br>8. (MH "Length of Stay")<br>9. (MH "Chronic Disease+")<br>10. TX ((chronic* or persist* or long term or longterm or prolong* or protract* or extend* or extensive or lengthy or difficult*) N3 (acute* or critical* or intens* or ill or illness* or sick or sickness* or care))<br>11. TX ((length or hospital) N3 stay)<br>12. TX ((chronic* or persist* or long term or longterm or prolong* or protract* or extend* or extensive or lengthy or difficult*) N3 (acute* or critical* or intens* or ill or illness* or sick or sickness* or care or disease))<br>13. 6 or 7 or 8 or 9 or 10 or 11 or 12<br>14. 5 and 13<br>15. 1 and 14 |
| Selection of sources of evidence | State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review. | Records will be downloaded into Endnote for duplicate removal and exported for screening to insightScope (www.insightscope.ca), a platform for executing large reviews through crowd-sourcing. Citation abstracts and full text articles will be uploaded with inclusion and exclusion criteria to insightScope. Reviewers with content and/or methodological expertise will be invited to the review team.<br><br>An iterative approach to screening will be used to evaluate and refine the inclusion and exclusion criteria. Three members of the core study team will independently review an initial set of 100 citations randomly selected from the full set to evaluate the initial eligibility criteria. The study team will screen these records in two steps (title and abstract, full text), discuss discrepancies, and refine the eligibility criteria. Following this initial round, the eligibility criteria will be re-evaluated using a second set of 100 citations. This iterative process will continue until the team has established |

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| | | consensus on study selection criteria and achieved a conflict rate of <20%.<br><br>Prior to formal screening, other reviewers who will assist with screening and data abstraction will first perform screening on the test set using the final eligibility criteria. The test set will contain a randomly selected set of 50 citations and will be piloted by two members of the core study team. If the randomly selected citations do not contain at least 5 eligible (true positive) citations, the test set will be enriched to meet this requirement. Additional reviewers must achieve a sensitivity ≥80% before they are given access to the full set of study records. Reviewers who do not achieve ≥80% sensitivity will be provided with additional training and repeat a second test set. If ≥80% sensitivity is achieved on the repeat test set, the reviewer will be given to access to the full set of study records. Prior to the start of the review, training will be provided to new members of the review team not familiar with the insightScope platform and/or protocol, as necessary.<br><br>Screening will be performed in two steps (title and abstract, full text) against inclusion criteria by at least two independent reviewers. Citations excluded at full-text screening will be recorded with reason(s) for exclusion. Screening conflicts will be resolved by the study lead (DZ), as required. |
| **Data charting process** | Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators. | Data abstraction will be performed using piloted electronic data abstraction forms created in Microsoft Excel. The data abstraction form will be created by one investigator and piloted by at least two members of the investigative team against a total of at least five eligible studies. Prior to formal data abstraction, reviewers will be provided with training. Data will be abstracted by two independent reviewers in duplicate. Data will be abstracted from the full text publication and any related publications, referenced published protocols, or supplementary materials. Where necessary, graphical data will be extracted by one reviewer using SourceForge Plot Digitizer (http://plotdigitizer.sourceforge.net) and checked by the second reviewer for accuracy. Conflicts in data abstraction will be resolved by consensus between reviewers and consultation with the study lead (DZ), as required. In the event of missing or unclear data, a maximum of three attempts will be made to contact study authors for clarification. |
| Data items | List and define all variables for which data will be sought any assumptions and simplifications made. | a) Study characteristics<br>▪ Author name and contact information<br>▪ Title<br>▪ Country of origin<br>▪ Journal and year of publication<br>▪ Study design (e.g., randomized trial, non-randomized trial, observational study, quality improvement study)<br>▪ Clinical setting/type of PICU (e.g., medical-surgical, cardiac only, neuro-PICU, etc.) |

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| | ▪ Total patients included (enrolled)<br>b) Study population demographics<br>▪ Age, sex<br>▪ Reason for PICU admission (as categorized by the article)<br>▪ Functional status characteristics (using validated tools, as categorized by the article)<br>▪ Severity of illness characteristics (using validated tools, as categorized by the article)<br>▪ Location of PICU (country)<br>c) Outcomes of interest<br>▪ Definition of study population of interest, as applicable to study:<br>• Definition of pediatric CCI (e.g., as defined by study or referenced from another publication)<br>• Definition of prolonged PICU admission (e.g., duration)<br>• If and how the definition was developed and/or validated by the primary study<br>▪ Prevalence of study participants with prolonged PICU admission or CCI, as applicable to study<br>▪ Clinical outcomes:<br>• Short-term: including mortality (types and specific details)<br>• Long-term: including patient/family-based outcomes (e.g., quality of life, functional status measures) with timing of follow-up<br>▪ Comorbidity/medical complexity status, including if and how patient medical complexity/comorbidity was described in the study, with results<br>▪ Resource utilization: Including prevalence and types of organ support technologies in study participants (e.g., mechanical ventilation, feeding support, circulatory support [vasoactive drugs, ECMO, ventricular assist device], extrarenal filtration); length of stay (PICU, hospital); discharge disposition (e.g., high-dependency unit, ward, rehabilitation facility, home); hospital readmission rates (e.g., PICU, hospital)<br>▪ Stated primary outcome of the study (if not listed above) and result |
| Critical appraisal of individual sources of evidence | For studies that sought to develop and/or validate a definition of prolonged PICU admission or pediatric CCI, a quality assessment will be performed with respect to the rigour of the conducted studies and the transparency of reporting, using standardized tools, where applicable. Otherwise, a critical appraisal of included studies will not be completed for this scoping review (10). |
| Summary measures | In keeping with the descriptive objectives of this scoping review, quantitative summary analyses are not planned (10). |
| Synthesis of results | Data will be descriptively and qualitatively summarized. Included studies will be grouped into one of the two definition domains (i.e., prolonged PICU admission, CCI) and data items will be summarized for each, respectively. |

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| | | Clinical outcomes abstracted will be categorized as per the PICU Core Outcome Set (11), as applicable. |
| Risk of bias across studies | | In keeping with the descriptive objectives of this scoping review, a formal risk of bias assessment is not planned (10). |
| Additional analyses | | In keeping with the descriptive objectives of this scoping review, additional analyses are not planned (10). |
| **Funding** | | |
| Sources | Indicate sources of financial or other support for the review | This scoping review has not received any specific funding. David Zorko was funded by a Canadian Institutes of Health Research (CIHR) Canada Graduate Scholarship. |
| Sponsor | Provide name for the review funder and/or sponsor | |
| Role of sponsor/ funder | Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol | The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the protocol. |

**References**


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