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Protocol for a scoping review on rehabilitation among individuals who experience homelessness and traumatic brain injury

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Protocol for a scoping review on rehabilitation among individuals who experience homelessness and traumatic brain injury

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ABSTRACT

Introduction: Rehabilitation is key to improving outcomes and quality of life after traumatic brain injury (TBI). However, individuals experiencing homelessness are rarely represented in research that informs evidence-based rehabilitation guidelines even though TBI is disproportionately prevalent among this population. This protocol is for a scoping review to explore the extent to which rehabilitation, including the types of rehabilitation interventions, is available to, or used by, individuals who experience homelessness and TBI to inform (a) opportunities to integrate rehabilitation for individuals who experience homelessness and TBI, (b) considerations for existing clinical and practice guidelines for rehabilitation, and (c) recommendations for future research.

Methods and analysis: The scoping review will be guided by six stages described in scoping review methodology frameworks. Electronic databases, reference list of included articles and scoping or systematic reviews identified from the search, and grey literature, defined as reports from relevant brain injury, housing, and rehabilitation organizations, will be searched. Two reviewers will independently screen all articles based on pre-determined inclusion and exclusion criteria. A descriptive numerical summary of data items will be provided and qualitative content analytic techniques will be used to identify and report common themes. Preliminary findings will be shared with stakeholders to seek feedback on the implications of the results.

Ethics and dissemination: Ethics review will not be required, as only publicly available data will be analyzed. Findings from the scoping review will be published in a peer-reviewed journal and presented at scientific meetings and to stakeholders, defined as service providers in the housing and brain injury sectors and health professionals who provide care for individuals with TBI and/or homelessness; health

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administrators, decision-makers, and policy-makers; researchers; and caregivers or family members of individuals with lived experience of TBI and homelessness.

Registration details: This protocol will be registered in the Open Science Framework (OSF) Registries.

Keywords: Traumatic brain injury, Rehabilitation, Homelessness, Underserved population, Vulnerable population

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STRENGTHS AND LIMITATIONS OF THIS STUDY

- To the best of our knowledge, this is the first scoping review of rehabilitation among individuals experiencing homelessness and TBI; findings will inform (a) opportunities to integrate rehabilitation for individuals who experience homelessness and TBI, (b) considerations for existing clinical and practice guidelines for rehabilitation, and (c) recommendations for future research
- This protocol is guided by scoping review methodology frameworks to improve methodological rigour, an identified limitation of existing rehabilitation scoping reviews, and describes a transparent approach to comprehensively identify literature on rehabilitation and TBI among underserved populations, which increases replicability
- Intersecting sex, gender, social identities, and vulnerabilities will be considered in the charting of the data, analysis, and reporting of findings
- We acknowledge the risk of publication bias because only peer-reviewed articles or published reports will be included
- To evaluate and report on the risk of publication bias, non-English articles will not be immediately excluded; the decision to include or exclude non-English language full-texts will be determined at the time of the review, taking into account the availability of resources and the proportion of non-English full-text articles

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INTRODUCTION

Homelessness is a global crisis affecting an estimated 100 million people worldwide and becoming increasingly prevalent in many countries.[1] In Canada, more than 200,000 individuals experience homelessness every year.[2] This number is based on a 2016 national report; however, recent studies suggest that the state of homelessness in the country is worsening.[3, 4] Individuals who experience homelessness suffer from a broad range of health concerns, including systemic disorders (e.g., chronic obstructive pulmonary disease, seizures, arthritis, musculoskeletal disorders, tuberculosis) and mental health conditions and substance use, all contributing to extremely high mortality rates.[5-7] Consistently underrecognized is traumatic brain injury (TBI). Defined as “an alteration in brain function or other evidence of brain pathology caused by an external force,”[8] TBI is a serious public health problem and the leading cause of death and disability among all trauma-related injuries globally.[9]

Approximately 1 in 2 individuals who are homeless or precariously housed experience a lifetime TBI while almost 1 in 4 individuals experience a moderate to severe TBI.[10] These individuals experience adverse consequences of TBI, including cognitive and behavioural challenges related to memory, attention, mental fatigue, and irritability; fatigue and balance problems; and an increased likelihood of developing neurologic and psychiatric conditions, all of which impact various areas of life and can be long-lasting or permanent.[11-15] Among those experiencing homelessness specifically, TBI has been found to be associated with poorer physical and mental health status, increased likelihood of seizures, mental health and substance use problems, higher risk for suicide, increased health service use, and increased criminal justice system involvement.[10, 16, 17] If unaddressed, the effects of TBI and homelessness combined could lead to a cycle of repeated TBIs, prolonged homelessness, and substantial economic and health-related costs.[17-19]

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The long-term negative outcomes of TBI, along with the intersecting challenges experienced by individuals who experience homelessness, demand long-term specialized supports including rehabilitation. Rehabilitation, defined as "a set of interventions designed to optimize functioning and reduce disability in individuals with health conditions in interaction with their environment," has been identified by the World Health Organization (WHO) as an integral part of the health care continuum; when integrated with primary healthcare, rehabilitation can reduce disability, optimize the outcomes of other interventions, and support full recovery.[20] Over the years, various rehabilitation interventions have been found beneficial in managing TBI symptoms and facilitating outcomes such as community integration and quality of life.[21, 22] The growing evidence base on TBI rehabilitation has informed the development of evidence-based guidelines that provide comprehensive recommendations for TBI care;[23] however, the research informing these guidelines do not sufficiently, if at all, represent underserved populations, such as individuals experiencing homelessness. Further, while reviews on TBI rehabilitation or clinical guidelines for homelessness exist,[21, 22, 24] there is none to date that focuses on rehabilitation interventions across disciplines for individuals who experience homelessness and TBI. This paucity of information suggests that existing evidence-based practice guidelines do not reflect rehabilitation that are specific to the needs of individuals who experience homelessness and TBI.

This protocol is for a scoping review that aims to address this gap, by exploring the extent to which rehabilitation, including types of rehabilitation interventions, is available to or used by individuals experiencing homelessness and TBI. This review will also aim to summarize findings across sex, gender, and other identity factors (e.g., age, race, ethnicity, and disability). To date, there is a lack of information across intersecting identities even though they contribute to unique experiences that cannot be addressed by looking at a single facet of identity.[25-28] The results of the scoping review will

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inform (a) opportunities to integrate rehabilitation for individuals who experience homelessness and TBI, (b) considerations for existing clinical and practice guidelines, and (c) recommendations for future research.

METHOD AND ANALYSIS

The scoping review will be guided by six stages described in Arksey and O'Malley's scoping review methodology framework and Levac and colleagues' additional recommendations to this framework[29, 30] – (1) identifying the research question, (2) identifying relevant studies, (3) selecting studies, (4) charting the data, (5) collating, summarizing, and reporting the results, and (6) consultation, which is an optional stage. The reporting of the scoping review will follow the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension or Scoping Reviews (PRISMA-ScR).[31]

Stage 1: Identifying the research question

The research question is: "To what extent is rehabilitation, including the types of rehabilitation intervention, available to, or used by, individuals who experience homelessness and TBI?" As rehabilitation encompasses a variety of disciplines and homelessness a variety of living situations, the following parameters and definitions will guide the scoping review, including the search strategy, study selection, charting of data, and reporting of findings.

Rehabilitation will be defined using (a) the WHO's definition[32] and (b) rehabilitation teams identified in evidence-based guidelines for TBI rehabilitation.[23, 33] Homelessness will be defined using the Canadian Observatory of Homelessness (COH, formerly the Canadian Homelessness Research Network) typology of homelessness: (a) unsheltered, (b) emergency sheltered, and (c)

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provisionally accommodated.[34] Table 1 illustrates the parameters and associated definitions for rehabilitation and homelessness that will guide the review.

Table 1. Parameters and associated definitions for rehabilitation and homelessness.

Concept	Parameter	Definition
Rehabilitation	World Health Organization's definition of rehabilitation[32]	"A set of interventions designed to optimize functioning and reduce disability in individuals with health conditions in interaction with their environment"
	Healthcare providers/professional disciplines identified in evidence-based clinical practice guidelines for rehabilitation[23, 33]	• Speech-language pathologists • Occupational therapist • Physiotherapist • Social worker • Neuropsychologist and psychometrist • Psychologist with expertise in behavioural therapy • Nurse • Physician and/or physiatrist • Rehabilitation support personnel • Nutritionist • Therapeutic recreationist
Homelessness[34]	Unsheltered	Individuals who lack housing and are not accessing shelters:

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		• "Public or private spaces without consent or contract" or • "Places not intended for permanent human habitation"
	Emergency sheltered	Individuals who cannot secure permanent housing and are accessing shelters or other system supports: • "Emergency overnight shelters for people who are homelessness" or • "Shelters for individuals/families impacted by family violence" or • "Emergency shelter for people fleeing a natural disaster or destruction of accommodation due to fires, floods, etc."
	Provisionally accommodated	Individuals without permanent shelter and are accessing accommodations that offer no prospect of permanent: • Interim housing • Living temporality with others • Accessing short-term, temporary rental without security of tenure • Living in institutional care and lack housing arrangements

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		• Accommodation/reception centres for recently arrived immigrants and refugees

Stage 2: Identifying relevant studies

The comprehensive database search strategy proposed in this protocol was developed with an Information Specialist (JB) and involved iterative revisions with research team members who possess research and subject-matter expertise relevant to rehabilitation, TBI, and homelessness (see Supplementary File 1). The search strategy is developed for the MEDLINE® ALL (in Ovid, including Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily) database, and will be translated to: Embase and Embase Classic (Ovid), Cochrane CENTRAL Register of Clinical Trials (Ovid), CINAHL (EBSCO), APA PsycINFO (Ovid), Applied Social Sciences Index and Abstracts (Proquest), and Nursing and Allied Health (Proquest).

The following concepts were developed to form the search strategy:

A. Homelessness

B. Rehabilitation

C. TBI or cognitive impairment

The final search strategy structure, (A + B) OR (A + C), will be used to search each database. No language or date limits will be placed on search strategies. In addition to comprehensive and structured database searching, reference list of included articles and scoping or systematic review articles identified from the search, and grey literature, defined as reports from relevant brain injury, housing, and rehabilitation organizations will be searched (see Supplementary File 1).

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Stage 3: Study selection

To be included in the scoping review, peer-reviewed articles, grey literature, and reference list of included primary research articles and scoping or systematic reviews must meet the following inclusion criteria:

a) Describe and/or document rehabilitation and/or rehabilitation interventions that aim to optimize functioning and reduce disability in interaction with their environment or the delivery of care or describe and/or document rehabilitation services provided by healthcare providers/professional disciplines, as defined in Table 1;
b) Focus on individuals who are experiencing homelessness, as defined in Table 1;
c) Include individuals with TBI; and
d) Report primary research findings.

Dissertations, conference proceedings, and articles that are narrative, commentaries, or describe a theory or framework without reporting primary research findings will be excluded. Articles that look at the broader brain-injured population (e.g., acquired brain injury) or individuals with cognitive impairment without specific mention of TBI will also be excluded.

Relevant studies retrieved using the above search strategy will be imported into EndNote X8.2 for reference management and Covidence for deduplication and study selection.[35] Two reviewers will independently screen all articles based on the above inclusion and exclusion criteria. At the title and abstract screen, articles that do not explicitly mention cognitive impairment or TBI will be considered for the full-text screen to confirm the study include individuals with TBI. Prior to formal screening, pilot testing of 20 titles and abstracts will be conducted, until a minimum 80% agreement using the kappa statistic is achieved between the reviewers. At the full-text review, pilot testing of 10% of the full-text articles will be conducted until a minimum of 80% agreement is achieved between the

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reviewers. Non-English language abstracts will be assessed using the published English abstract and the decision to include these articles in the full-text articles will be determined at the time of the review, considering the availability of resources and proportion of non-English full-text articles. Any discrepancies during the study selection stage will be resolved by consensus or consultation with a third reviewer. The study selection process will be presented using the Preferred Reporting Items for Systematic Reviews and Meta Analyses flow chart.[31]

Stage 4: Charting the data

Table 2 presents the charting table for the scoping review, which will be continually refined, as recommended by Levac and colleagues' methodology framework.[30] One reviewer will independently complete the charting table for each study and the completed table will then be independently peer-reviewed by a second reviewer. Similar to the study selection stage, charting of the data will begin with a random sample of five articles until a minimum of 80% agreement is achieved between the reviewers. Discrepancies in charting the data will be resolved by consensus or in consultation with a third reviewer.

Table 2. Charting table.

Data Item		**Description**
Study characteristics	Author	
	Year of publication	
	Country of study	
	Type of article	Note if the article was a peer-reviewed publication or grey literature

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	Study design	Specify if the study was quantitative, qualitative, or mixed methods and describe the study design
	Objective	Describe the stated objective of the study
Study sample	TBI	Specify the definition of TBI or how TBI was identified/determined Specify the injury severity, time since injury, method of diagnosis/screening, and the sample (N, %) of individuals with TBI
	Homelessness	Specify the definition of homelessness Specify the sample (N, %) of individuals experiencing homelessness
	Age	Specify participants' age at the time of the study, at the time of TBI, and at the time of homelessness
	Sex/Gender	Specify if Sex- and Gender-Based Analysis Plus (SGBA+) was considered in the study design[36] Note if and/or how sex and gender were defined in the study. Specify the participants' sex and/or gender (N, %)

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	Sociodemographic	Specify sociodemographic characteristics of the sample (e.g., race, ethnicity, religion, disability, geography, culture, income, education) Note if/describe how the sample of individuals with homelessness and TBI intersect with the criminal justice/legal system or experienced violence, including intimate partner violence Note if/describe how the article acknowledged and/or accounted for intersecting social identities and/or vulnerabilities
Rehabilitation	Intervention	Describe the focus or goal of the intervention Describe the type of rehabilitation intervention, how the intervention was delivered, the length or frequency of the intervention, and the setting of intervention Note the theories or principles of care that are guiding the intervention studied in the article

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		Note if/describe how the intervention acknowledged and/or accounted for intersecting social identities and vulnerabilities
	Rehabilitation team	List the healthcare providers/professional disciplines that were involved in the intervention or rehabilitation process
	Outcome	Describe the outcome of the intervention Note any outcome(s) relevant to intersectionality
	Barriers	Describe any stated barriers to rehabilitation for individuals experiencing homelessness and TBI
	Facilitators	Describe any stated facilitators to rehabilitation for individuals experiencing homelessness and TBI
	Gaps	Describe any stated gaps in research on rehabilitation for individuals experiencing homelessness and TBI

Stage 5: Collating, summarizing, and reporting the results

As recommended by Levac and colleagues' methodology framework,[30] stage 5 will follow three distinct steps that may be refined further towards the end of the review, based on the content of the included articles:

1. Analyzing the data – a descriptive numerical summary of study characteristics, study sample, rehabilitation, and barriers, facilitators, and gaps will be provided and qualitative content analytic techniques will be applied to inform steps 2 (reporting results) and 3 (applying meaning

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to the results);[37] this method of data analysis is appropriate for this review, as it allows for the quantification of data (i.e., taking into account the frequency of similar codes) in themes or category development.[38]

2. Reporting results – findings will be reported in relation to the research question (the extent to which rehabilitation, including the types of rehabilitation interventions, is available to, or used by, individuals who experience homelessness and TBI).
3. Applying meaning to the results – implications for (a) opportunities to integrate rehabilitation for individuals who experience homelessness and TBI, (b) considerations for existing clinical and practice guidelines for rehabilitation, and (c) recommendations for future research will be considered.

Stage 6: Consultation

Preliminary findings from stage 5 will be shared with stakeholders of this scoping review to identify additional literature and seek feedback on the implications of the review on (a) opportunities to integrate rehabilitation for individuals who experience homelessness and TBI, (b) considerations for existing clinical and practice guidelines for rehabilitation, and (c) recommendations for future research. Stakeholders include front-line staff and service providers in the housing and brain injury sectors; health administrators, decision-makers, and policy-makers; health professionals who provide care for individuals with TBI and/or individuals who experience homelessness; researchers and trainees who conduct research on rehabilitation, TBI, and homelessness; and caregivers or family members of individuals with lived experience of TBI and/or homelessness.

Patient and public involvement

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Patients and the public were not involved in the creation of this scoping review protocol. However, stage 6 of our proposed methods will engage stakeholders of this scoping review.

Ethics and Dissemination

Ethics review will not be required because only published and publicly available data will be analyzed. The scoping review will be published in a peer-reviewed journal. Findings will be presented at scientific conferences and stakeholders defined in stage six of the scoping review.

Strengths and Limitations

We acknowledge the risk of publication bias, as only peer-reviewed articles or published reports will be included. For example, pilot studies conducted as theses will not be captured in the scoping review unless they are published in peer-reviewed journals. However, this protocol aims to minimize publication bias by including non-English articles in the title and abstract screen using the published English version of the abstract. The decision to include or exclude non-English language full-texts will be determined at the time of the review, taking into account the availability of resources and proportion of non-English full-text articles. Furthermore, it is recognized that community organizations serving individuals experiencing homelessness and/or TBI may produce non-peer-reviewed reports of the services they offer. As such, grey literature, defined as reports published by brain injury, housing, and rehabilitation organizations, will also be searched.

To the best of our knowledge, this is the first protocol for a scoping review on rehabilitation among individuals who experience homelessness and TBI. This protocol is guided by scoping review methodology frameworks to improve methodological rigour, which also addresses an identified limitation of existing rehabilitation scoping review.[39] This protocol also describes a transparent

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approach to comprehensively identify literature on rehabilitation and TBI among underserved populations, which increases credibility and replicability. Importantly, intersecting sex, gender, social identities, and vulnerabilities, which are often overlooked in the literature, will be considered in the charting of the data, analysis, and reporting of findings. Findings from the scoping review will provide an evidence-based foundation to inform (a) opportunities to integrate rehabilitation for TBI for individuals experiencing homelessness, (b) considerations for existing clinical and practice guidelines, and (c) recommendations future research.

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AUTHORS' CONTRIBUTIONS

VC and AC conceptualized the study. VC, JE, and JB developed the search strategy. VC and JE formulated the design and drafted the manuscript. All authors critically reviewed the manuscript and approved the final manuscript.

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COMPETING INTERESTS

None declared.

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Supplementary File 1

Search Description

This strategy was first developed in Medline, and was then translated to other databases. It uses the following concepts:

- Concept A (lines 1-15): Homelessness
- Concept B (lines 17-42) : Rehabilitation
- Concept C (lines 44-55): Traumatic brain injury or cognitive impairment

The search conducted is: (A + B) OR (A + C). This strategy was used in all searched databases. Searches were also limited to human studies when possible. No date or language limits were applied.

Search Strategy

Database: Ovid MEDLINE(R) ALL <1946 to April 20, 2021>

1 exp Homeless persons/
2 homeless*.tw,kf.
3 Roofless*.tw,kf.
4 (Marginal* adj3 hous*).tw,kf.
5 (precarious* adj3 hous*).tw,kf.
6 (unstabl* adj3 hous*).tw,kf.
7 (instab* adj3 hous*).tw,kf.
8 (interim* adj3 hous*).tw,kf.
9 (temporary adj3 (liv* or hous*)).tw,kf.
10 ((liv* or sleep* or stay or emergenc*) adj3 shelter??).tw,kf.
11 houseless*.tw,kf.
12 unsheltered.tw,kf.
13 rough sleeper?.tw,kf.
14 rough sleeping.tw,kf.
15 provisionally accommodat*.tw,kf.
16 or/1-15
17 "Physical and Rehabilitation Medicine"/
18 exp rehabilitation/
19 rehab*.tw,kf,jw.
20 telerehab*.tw,kf,jw.
21 neurorehab*.tw,kf,jw.
22 rh.fs.
23 Rehabilitation Centers/
24 (physiatrist? or physiatry).tw,kf.
25 occupational therapy/
26 (occupational adj therap*).tw,kf,jw.
27 physical therapy specialty/
28 (physical adj therap*).tw,kf,jw.
29 physiotherap*.tw,kf,jw.
30 physio-therapist*.tw,kf,jw.
31 Speech-Language Pathology/
32 (speech adj2 (therap* or patholog*)).tw,kf,jw.
33 Neuropsychology/

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34 Neuropsycholog*.tw,kf,jw.
35 Nutritionists/
36 (Nutritionist? or Dietician?).tw,kf,jw.
37 (therap* adj recreation*).tw,kf,jw.
38 child life specialist?.tw,kf.
39 play therapy/
40 (play adj therap*).tw,kf.
41 Respite Care/
42 respite.tw,kf.
43 or/17-42
44 exp Brain Injuries/
45 exp Brain Injuries, Traumatic/
46 exp Brain Concussion/
47 Craniocerebral Trauma/
48 tbi*2.tw,kf.
49 mtbi*2.tw,kf.
50 concuss*.tw,kf.
51 postconcuss*.tw,kf.
52 ((head* or brain* or cerebr* or crani* or skull* or intracran*) adj2 (injur* or trauma* or damag* or wound* or swell* or oedema* or edema* or fracture* or contusion* or pressur*)).tw,kf,jw.
53 ((brain* or cerebr* or intracerebr* or crani* or intracran* or head* or subdural* or epidural* or extradural*) adj (haematoma* or hematoma* or hemorrhag* or haemorrhag* or bleed*)).tw,kf.
54 exp cognition disorders/
55 ((cogniti* or neurocogniti*) adj2 (impair* or dysfunction* or disorder* or declin*)).tw,kf.
56 or/44-55
57 16 and 43
58 16 and 56
59 57 or 58
60 59 not (exp animals/ not humans.sh.)

Grey Literature

Reports from the following brain injury, housing, and rehabilitation organizations will be searched:

- American Academy of Physical Medicine and Rehabilitation
- Canadian Alliance to End Homelessness
- Canadian Housing First Toolkit
- Centre for Urban Health Solutions
- Cochrane Methods Equity Homeless Health Guidelines
- Evidence Exchange Network for Mental Health Addictions
- Mental Health Commission of Canada
- Model Systems Knowledge Translation Center
- National Association of State Head Injury
- National Health Care for the Homeless Council
- Ruff Institute of Global Homelessness
- The Center for Brain Injury Research and Training
- The Homeless Hub

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- Toronto Alliance to End Homelessness
- Toronto Mental Health and Addictions Supportive Housing Network
- Wellesley Institute

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BMJ Open

Protocol for a scoping review on rehabilitation among individuals who experience homelessness and traumatic brain injury

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Keywords:	PUBLIC HEALTH, REHABILITATION MEDICINE, TRAUMA MANAGEMENT

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Protocol for a scoping review on rehabilitation among individuals who experience homelessness and traumatic brain injury

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ABSTRACT

Introduction: Rehabilitation is key to improving outcomes and quality of life after traumatic brain injury (TBI). However, individuals experiencing homelessness are rarely represented in research that informs evidence-based rehabilitation guidelines even though TBI is disproportionately prevalent among this population. This protocol is for a scoping review to explore the extent to which rehabilitation, including the types of rehabilitation interventions, is available to, or used by, individuals who experience homelessness and TBI to inform (a) opportunities to integrate rehabilitation for individuals who experience homelessness and TBI, (b) considerations for existing clinical and practice guidelines for rehabilitation, and (c) recommendations for future research.

Methods and analysis: The scoping review will be guided by six stages described in scoping review methodology frameworks. Electronic databases (MEDLINE, Embase and Embase Classic, Cochrane CENTRAL Register of Clinical Trials, CINAHL, APA PsycINFO, Applied Social Sciences Index and Abstracts, and Nursing and Allied Health), reference list of included articles and scoping or systematic reviews identified from the search, and grey literature, defined as reports from relevant brain injury, housing, and rehabilitation organizations, will be searched. Two reviewers will independently screen all articles based on pre-determined inclusion and exclusion criteria. A descriptive numerical summary of data items will be provided and qualitative content analytic techniques will be used to identify and report common themes. Preliminary findings will be shared with stakeholders to seek feedback on the implications of the results.

Ethics and dissemination: Ethics review will not be required, as only publicly available data will be analyzed. Findings from the scoping review will be published in a peer-reviewed journal and presented at scientific meetings and to stakeholders, defined as service providers in the housing and TBI sectors;

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health professionals who provide care for individuals with TBI and/or homelessness; health administrators, decision-makers, and policy-makers; researchers; and caregivers or family members of individuals with lived experience of TBI and homelessness.

Registration details: This protocol will be registered in the Open Science Framework (OSF) Registries.

Keywords: Traumatic brain injury, Rehabilitation, Homelessness, Underserved population, Vulnerable population

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STRENGTHS AND LIMITATIONS OF THIS STUDY

- To the best of our knowledge, this is the first scoping review of rehabilitation among individuals experiencing homelessness and TBI; findings will inform (a) opportunities to integrate rehabilitation for individuals who experience homelessness and TBI, (b) considerations for existing clinical and practice guidelines for rehabilitation, and (c) recommendations for future research
- This protocol is guided by scoping review methodology frameworks to improve methodological rigour, an identified limitation of existing rehabilitation scoping reviews, and describes a transparent approach to comprehensively identify literature on rehabilitation and TBI among underserved populations, which increases replicability
- Intersecting sex, gender, social identities, and vulnerabilities will be considered in the charting of the data, analysis, and reporting of findings
- We acknowledge the risk of publication bias because only peer-reviewed articles or published reports will be included
- To evaluate and report on the risk of publication bias, non-English articles will not be immediately excluded; the decision to include or exclude non-English language full-texts will be determined at the time of the review, taking into account the availability of resources and the proportion of non-English full-text articles

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INTRODUCTION

Homelessness is a global crisis affecting an estimated 100 million people worldwide and becoming increasingly prevalent in many countries.[1] In Canada, more than 200,000 individuals experience homelessness every year.[2] This number is based on a 2016 national report; however, recent studies suggest that the state of homelessness in the country is worsening.[3, 4] Individuals who experience homelessness suffer from a broad range of health concerns, including systemic disorders (e.g., chronic obstructive pulmonary disease, seizures, arthritis, musculoskeletal disorders, tuberculosis) and mental health conditions and substance use, all contributing to extremely high mortality rates.[5-7] Consistently underrecognized is traumatic brain injury (TBI). Defined as "an alteration in brain function or other evidence of brain pathology caused by an external force,"[8] TBI is a serious public health problem and the leading cause of death and disability among all trauma-related injuries globally.[9]

Approximately 1 in 2 individuals who are homeless or precariously housed experience a lifetime TBI while almost 1 in 4 individuals experience a moderate to severe TBI.[10] Evidence suggests that the relationship between TBI and homelessness is bidirectional, with TBI preceding and prolonging homelessness.[10-12] The first incidence of TBI was often found to occur before the onset of homelessness,[12] and moderate to severe TBI was associated with the initial loss of stable housing and a longer duration of homelessness and precarious housing.[11] Individuals with TBI often experience cognitive and behavioural challenges related to memory, attention, mental fatigue, and irritability; fatigue and balance problems; and an increased likelihood of developing neurologic and psychiatric conditions, all of which impact various areas of life and can be long-lasting or permanent.[13-17] Among those experiencing homelessness specifically, TBI has been found to be associated with poorer physical and mental health status, increased likelihood of seizures, mental health and substance use

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problems, higher risk for suicide, increased health service use, and increased criminal justice system involvement.[10, 18, 19] TBI-specific challenges, combined with other physical and mental health problems, and factors such as financial constraints and lack of social supports, lead to difficulties maintaining housing and increase the risk for homelessness. As the literature suggests, homelessness is a fluid experience characterized by frequent shifts in physical living situations (i.e., unsheltered, emergency, and provisionally accommodated) and changes in housing status (i.e., at risk of homelessness to experiencing homelessness).[20] If unaddressed, the effects of TBI and homelessness combined could lead to a cycle of repeated TBIs, prolonged homelessness, and substantial economic and health-related costs.[19, 21, 22]

The long-term negative outcomes of TBI, along with the intersecting challenges experienced by individuals who experience homelessness, demand long-term specialized supports including rehabilitation. Rehabilitation, defined as "a set of interventions designed to optimize functioning and reduce disability in individuals with health conditions in interaction with their environment," has been identified by the World Health Organization (WHO) as an integral part of the health care continuum; when integrated with primary healthcare, rehabilitation can reduce disability, optimize the outcomes of other interventions, and support full recovery.[23] Over the years, various rehabilitation interventions have been found beneficial in managing TBI symptoms and facilitating outcomes such as community integration and quality of life.[24, 25] The growing evidence base on TBI rehabilitation has informed the development of evidence-based guidelines that provide comprehensive recommendations for TBI care;[26] however, the research informing these guidelines do not sufficiently, if at all, represent underserved populations, such as individuals experiencing homelessness. Further, while reviews on TBI rehabilitation or clinical guidelines for homelessness exist,[24, 25, 27] there is none to date that focuses on rehabilitation interventions across disciplines for individuals who experience homelessness and TBI. This paucity of information suggests that existing evidence-based practice guidelines do not

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reflect rehabilitation that are specific to the needs of individuals who experience homelessness and TBI.

This protocol is for a scoping review that aims to address this gap, by exploring the extent to which rehabilitation, including types of rehabilitation interventions, is available to or used by individuals experiencing homelessness and TBI. This review will also aim to summarize findings across sex, gender, and other identity factors (e.g., age, race, ethnicity, and disability). To date, there is a lack of information across intersecting identities even though they contribute to unique experiences that cannot be addressed by looking at a single facet of identity.[28-31] The results of the scoping review will inform (a) opportunities to integrate rehabilitation for individuals who experience homelessness and TBI, (b) considerations for existing clinical and practice guidelines, and (c) recommendations for future research.

METHOD AND ANALYSIS

The scoping review will be guided by six stages described in Arksey and O'Malley's scoping review methodology framework and Levac and colleagues' additional recommendations to this framework[32, 33] – (1) identifying the research question, (2) identifying relevant studies, (3) selecting studies, (4) charting the data, (5) collating, summarizing, and reporting the results, and (6) consultation, which is an optional stage. The reporting of the scoping review will follow the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension or Scoping Reviews (PRISMA-ScR).[34]

Stage 1: Identifying the research question

The research question is: "To what extent is rehabilitation, including the types of rehabilitation intervention, available to, or used by, individuals who experience homelessness and TBI?" As

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rehabilitation encompasses a variety of disciplines and homelessness a variety of living situations, the following parameters and definitions will guide the scoping review, including the search strategy, study selection, charting of data, and reporting of findings.

Rehabilitation will be defined using (a) the WHO's definition[35] and (b) rehabilitation teams identified in evidence-based guidelines for TBI rehabilitation.[26, 36] Homelessness will be defined using the Canadian Observatory of Homelessness (COH, formerly the Canadian Homelessness Research Network) typology of homelessness that encompasses the following physical living situations: (a) unsheltered, (b) emergency sheltered, and (c) provisionally accommodated.[20] Table 1 illustrates the parameters and associated definitions for rehabilitation and homelessness that will guide the review.

Table 1. Parameters and associated definitions for rehabilitation and homelessness.

Concept	Parameter	Definition
Rehabilitation	World Health Organization's definition of rehabilitation[35]	"A set of interventions designed to optimize functioning and reduce disability in individuals with health conditions in interaction with their environment"
	Healthcare providers/professional disciplines identified in evidence-based clinical practice guidelines for rehabilitation[26, 36]	• Speech-language pathologists • Occupational therapist • Physiotherapist • Social worker • Neuropsychologist and psychometrist • Psychologist with expertise in behavioural therapy • Nurse • Physician and/or physiatrist • Rehabilitation support personnel • Nutritionist • Therapeutic recreationist
Homelessness[20]	Unsheltered	Individuals who lack housing and are not accessing shelters: • "Public or private spaces without consent or contract" or • "Places not intended for permanent human habitation"

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	Emergency sheltered	Individuals who cannot secure permanent housing and are accessing shelters or other system supports: • "Emergency overnight shelters for people who are homelessness" or • "Shelters for individuals/families impacted by family violence" or • "Emergency shelter for people fleeing a natural disaster or destruction of accommodation due to fires, floods, etc."
	Provisionally accommodated	Individuals without permanent shelter and are accessing accommodations that offer no prospect of permanent: • Interim housing • Living temporality with others • Accessing short-term, temporary rental without security of tenure • Living in institutional care and lack housing arrangements • Accommodation/reception centres for recently arrived immigrants and refugees

Stage 2: Identifying relevant studies

The comprehensive database search strategy proposed in this protocol was developed with an Information Specialist (JB) and involved iterative revisions with research team members who possess research and subject-matter expertise relevant to rehabilitation, TBI, and homelessness (see Supplementary File 1). The search strategy is developed for the MEDLINE® ALL (in Ovid, including Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily) database, and will be translated to: Embase and Embase Classic (Ovid), Cochrane CENTRAL Register of Clinical Trials (Ovid), CINAHL (EBSCO), APA PsycINFO (Ovid), Applied Social Sciences Index and Abstracts (Proquest), and Nursing and Allied Health (Proquest).

The following concepts were developed to form the search strategy:

A. Homelessness

B. Rehabilitation

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C. TBI or cognitive impairment

The final search strategy structure, (A + B) OR (A + C), will be used to search each database. No language or date limits will be placed on search strategies. In addition to comprehensive and structured database searching, reference list of included articles and scoping or systematic review articles identified from the search, and grey literature, defined as reports from relevant brain injury, housing, and rehabilitation organizations will be searched (see Supplementary File 1).

Stage 3: Study selection

To be included in the scoping review, peer-reviewed articles, grey literature, and reference list of included primary research articles and scoping or systematic reviews must meet the following inclusion criteria:

a) Describe and/or document rehabilitation and/or rehabilitation interventions that aim to optimize functioning and reduce disability in interaction with their environment or the delivery of care or describe and/or document rehabilitation services provided by healthcare providers/professional disciplines, as defined in Table 1;
b) Focus on individuals who are experiencing homelessness, as defined in Table 1;
c) Include individuals with TBI; and
d) Report primary research findings.

Dissertations, conference proceedings, and articles that are narrative, commentaries, or describe a theory or framework without reporting primary research findings will be excluded. Articles that look at the broader brain-injured population (e.g., acquired brain injury) or individuals with cognitive impairment without specific mention of TBI will also be excluded.

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Relevant studies retrieved using the above search strategy will be imported into EndNote X8.2 for reference management and Covidence for deduplication and study selection.[37] Two reviewers will independently screen all articles based on the above inclusion and exclusion criteria. At the title and abstract screen, articles that do not explicitly mention cognitive impairment or TBI will be considered for the full-text screen to confirm the study include individuals with TBI. Prior to formal screening, pilot testing of 20 titles and abstracts will be conducted, until a minimum 80% agreement using the kappa statistic is achieved between the reviewers. At the full-text review, pilot testing of 10% of the full-text articles will be conducted until a minimum of 80% agreement is achieved between the reviewers. Non-English language abstracts will be assessed using the published English abstract and the decision to include these articles in the full-text articles will be determined at the time of the review, considering the availability of resources and proportion of non-English full-text articles. Any discrepancies during the study selection stage will be resolved by consensus or consultation with a third reviewer. The study selection process will be presented using the Preferred Reporting Items for Systematic Reviews and Meta Analyses flow chart.[34]

Stage 4: Charting the data

Table 2 presents the charting table for the scoping review, which will be continually refined, as recommended by Levac and colleagues' methodology framework.[33] One reviewer will independently complete the charting table for each study and the completed table will then be independently peer-reviewed by a second reviewer. Similar to the study selection stage, charting of the data will begin with a random sample of five articles until a minimum of 80% agreement is achieved between the reviewers. Discrepancies in charting the data will be resolved by consensus or in consultation with a third reviewer.

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Table 2. Charting table.

Data Item		Description
Study characteristics	Author	
	Year of publication	
	Country of study	
	Type of article	Note if the article was a peer-reviewed publication or grey literature
	Study design	Specify if the study was quantitative, qualitative, or mixed methods and describe the study design
	Objective	Describe the stated objective of the study
Study sample	TBI	Specify the definition of TBI or how TBI was identified/determined Specify the injury severity, time since injury, method of diagnosis/screening, timing of TBI relative to homelessness (e.g., whether TBI predated homelessness, if the individual was homeless at the time of TBI), and the sample (N, %) of individuals with TBI
	Homelessness	Specify the definition of homelessness Specify the sample (N, %) of individuals experiencing homelessness
	Age	Specify participants' age at the time of the study, at the time of TBI, and at the time of homelessness
	Sex/Gender	Specify if Sex- and Gender-Based Analysis Plus (SGBA+) was considered in the study design[38] Note if and/or how sex and gender were defined in the study. Specify the participants' sex and/or gender (N, %)
	Sociodemographic	Specify sociodemographic characteristics of the sample (e.g., race, ethnicity, religion, disability, geography, culture, income, education), including experiences consistent with those at risk of homelessness as defined in the COH [20] Note if/describe how the sample of individuals with homelessness and TBI intersect with the criminal justice/legal system or experienced violence, including intimate partner violence Note if/describe how the article acknowledged and/or accounted for intersecting social identities and/or vulnerabilities
Rehabilitation	Intervention	Describe the focus or goal of the intervention

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		Describe the type of rehabilitation intervention, how the intervention was delivered, the length or frequency of the intervention, and the setting of intervention Note the theories or principles of care that are guiding the intervention studied in the article Note if/describe how the intervention acknowledged and/or accounted for intersecting social identities and vulnerabilities and housing status at the time of intervention
	Rehabilitation team	List the healthcare providers/professional disciplines that were involved in the intervention or rehabilitation process Note if the rehabilitation team collaborates with or have access to housing providers and other providers/disciplines not specified in Table 1
	Outcome	Describe the outcome of the intervention Note any outcome(s) relevant to intersectionality
	Barriers	Describe any stated barriers to rehabilitation for individuals experiencing homelessness and TBI
	Facilitators	Describe any stated facilitators to rehabilitation for individuals experiencing homelessness and TBI
	Gaps	Describe any stated gaps in research on rehabilitation for individuals experiencing homelessness and TBI

Stage 5: Collating, summarizing, and reporting the results

As recommended by Levac and colleagues' methodology framework,[33] stage 5 will follow three distinct steps that may be refined further towards the end of the review, based on the content of the included articles:

1. Analyzing the data – a descriptive numerical summary of study characteristics, study sample, rehabilitation, and barriers, facilitators, and gaps will be provided and qualitative content analytic techniques will be applied to inform steps 2 (reporting results) and 3 (applying meaning to the results);[39] this method of data analysis is appropriate for this review, as it allows for the quantification of data (i.e., taking into account the frequency of similar codes) in themes or category development.[40] Furthermore, we will assess the quality of the included studies using

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the Study Quality Assessment Tools designed by methodologists from the Research Triangle Institute International and the National Heart, Lung, and Blood Institute of the National Institutes of Health. These tools aim to assess the internal validity of a study, including sources of bias, confounding, study power, and other factors [41], to critically appraise different study designs. These quality assessments tools will be used to inform the process of applying meaning to the results, specified in step 3. No articles will be eliminated based on the quality assessment.

2. Reporting results – findings will be reported in relation to the research question (the extent to which rehabilitation, including the types of rehabilitation interventions, is available to, or used by, individuals who experience homelessness and TBI).
3. Applying meaning to the results – implications for (a) opportunities to integrate rehabilitation for individuals who experience homelessness and TBI, (b) considerations for existing clinical and practice guidelines for rehabilitation, and (c) recommendations for future research will be considered.

Stage 6: Consultation

Preliminary findings from stage 5 will be shared with stakeholders of this scoping review to identify additional literature and seek feedback on the implications of the review on (a) opportunities to integrate rehabilitation for individuals who experience homelessness and TBI, (b) considerations for existing clinical and practice guidelines for rehabilitation, and (c) recommendations for future research. Stakeholders include front-line staff and service providers in the housing and brain injury sectors; health administrators, decision-makers, and policy-makers; health professionals who provide care for individuals with TBI and/or individuals who experience homelessness; researchers and trainees who conduct research on rehabilitation, TBI, and homelessness; and caregivers or family members of individuals with lived experience of TBI and/or homelessness.

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Patient and public involvement

Patients and the public were not involved in the creation of this scoping review protocol. However, stage 6 of our proposed methods will engage stakeholders of this scoping review.

Ethics and Dissemination

Ethics review will not be required because only published and publicly available data will be analyzed. The scoping review will be published in a peer-reviewed journal. Findings will be presented at scientific conferences and stakeholders defined in stage six of the scoping review.

Strengths and Limitations

We acknowledge the risk of publication bias, as only peer-reviewed articles or published reports will be included. For example, pilot studies conducted as theses will not be captured in the scoping review unless they are published in peer-reviewed journals. However, this protocol aims to minimize publication bias by including non-English articles in the title and abstract screen using the published English version of the abstract. The decision to include or exclude non-English language full-texts will be determined at the time of the review, taking into account the availability of resources and proportion of non-English full-text articles. Furthermore, it is recognized that community organizations serving individuals experiencing homelessness and/or TBI may produce non-peer-reviewed reports of the services they offer. As such, grey literature, defined as reports published by brain injury, housing, and rehabilitation organizations, will also be searched. We also acknowledge that the inclusion of quality assessment deviates from the methodology frameworks used to inform this protocol [32, 33]. No studies will be excluded from this scoping review based on the quality assessment, however, results from the assessment will be considered when we apply meaning to the findings that are used to inform

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considerations for future research, the integration of rehabilitation, and clinical and best practices guidelines. Finally, this scoping review will not explicitly search for articles that only focus on individuals at risk of homelessness, defined as "people who are not homeless, but whose current economic and/or housing situation is precarious or does not meet public health and safety standard."[20] For example, articles that focus on precariously employed individuals without explicit mention of being unsheltered, emergency sheltered, and provisionally accommodated will not be included in this review. We acknowledge that homelessness is a fluid experience, with similar factors associated with unmet healthcare needs among those who are homeless and vulnerably housed. [42] However, the goal of this scoping review is to explore the extent to which rehabilitation, including the types of rehabilitation intervention, is available to, or used by individuals experiencing homelessness and TBI. Rehabilitation studies focused on individuals with TBI who are unsheltered, emergency sheltered, and provisionally accommodated may describe a different rehabilitation experience than studies that focus on individuals at risk of homelessness. As such, this scoping review will not explicitly search for articles that only include individuals at risk of homelessness. Instead, the charting and analysis of the data will identify and contextualize social determinants of health and other factors that put them at imminent risk of homelessness. Future reviews on rehabilitation that are focused specifically on individuals at risk of homelessness, or specific populations at risk of homelessness, are encouraged.

To the best of our knowledge, this is the first protocol for a scoping review on rehabilitation among individuals who experience homelessness and TBI. This protocol is guided by scoping review methodology frameworks to improve methodological rigour, which also addresses an identified limitation of existing rehabilitation scoping review.[43] This protocol also describes a transparent approach to comprehensively identify literature on rehabilitation and TBI among underserved populations, which increases credibility and replicability. Importantly, intersecting sex, gender, social

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identities, and vulnerabilities, which are often overlooked in the literature, will be considered in the charting of the data, analysis, and reporting of findings. Findings from the scoping review will provide an evidence-based foundation to inform (a) opportunities to integrate rehabilitation for TBI for individuals experiencing homelessness, (b) considerations for existing clinical and practice guidelines, and (c) recommendations future research.

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AUTHORS' CONTRIBUTIONS

VC and AC conceptualized the study. VC, JE, and JB developed the search strategy. VC and JE formulated the design and drafted the manuscript. All authors critically reviewed the manuscript and approved the final manuscript.

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COMPETING INTERESTS

None declared.

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Supplementary File 1

Search Description

This strategy was first developed in Medline, and was then translated to other databases. It uses the following concepts:

- Concept A (lines 1-15): Homelessness
- Concept B (lines 17-42): Rehabilitation
- Concept C (lines 44-55): Traumatic brain injury or cognitive impairment

The search conducted is: (A + B) OR (A + C). This strategy was used in all searched databases. Searches were also limited to human studies when possible. No date or language limits were applied.

Search Strategy

Database: Ovid MEDLINE(R) ALL <1946 to April 20, 2021>

1 exp Homeless persons/
2 homeless*.tw,kf.
3 Roofless*.tw,kf.
4 (Marginal* adj3 hous*).tw,kf.
5 (precarious* adj3 hous*).tw,kf.
6 (unstabl* adj3 hous*).tw,kf.
7 (instab* adj3 hous*).tw,kf.
8 (interim* adj3 hous*).tw,kf.
9 (temporary adj3 (liv* or hous*)).tw,kf.
10 ((liv* or sleep* or stay or emergenc*) adj3 shelter??).tw,kf.
11 houseless*.tw,kf.
12 unsheltered.tw,kf.
13 rough sleeper?.tw,kf.
14 rough sleeping.tw,kf.
15 provisionally accommodat*.tw,kf.
16 or/1-15
17 "Physical and Rehabilitation Medicine"/
18 exp rehabilitation/
19 rehab*.tw,kf,jw.
20 telerehab*.tw,kf,jw.
21 neurorehab*.tw,kf,jw.
22 rh.fs.
23 Rehabilitation Centers/
24 (physiatrist? or physiatry).tw,kf.
25 occupational therapy/
26 (occupational adj therap*).tw,kf,jw.
27 physical therapy specialty/
28 (physical adj therap*).tw,kf,jw.
29 physiotherap*.tw,kf,jw.
30 physio-therapist*.tw,kf,jw.
31 Speech-Language Pathology/
32 (speech adj2 (therap* or patholog*)).tw,kf,jw.
33 Neuropsychology/

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34 Neuropsycholog*.tw,kf,jw.
35 Nutritionists/
36 (Nutritionist? or Dietician?).tw,kf,jw.
37 (therap* adj recreation*).tw,kf,jw.
38 child life specialist?.tw,kf.
39 play therapy/
40 (play adj therap*).tw,kf.
41 Respite Care/
42 respite.tw,kf.
43 or/17-42
44 exp Brain Injuries/
45 exp Brain Injuries, Traumatic/
46 exp Brain Concussion/
47 Craniocerebral Trauma/
48 tbi*2.tw,kf.
49 mtbi*2.tw,kf.
50 concuss*.tw,kf.
51 postconcuss*.tw,kf.
52 ((head* or brain* or cerebr* or crani* or skull* or intracran*) adj2 (injur* or trauma* or damag* or wound* or swell* or oedema* or edema* or fracture* or contusion* or pressur*)).tw,kf,jw.
53 ((brain* or cerebr* or intracerebr* or crani* or intracran* or head* or subdural* or epidural* or extradural*) adj (haematoma* or hematoma* or hemorrhag* or haemorrhag* or bleed*)).tw,kf.
54 exp cognition disorders/
55 ((cogniti* or neurocogniti*) adj2 (impair* or dysfunction* or disorder* or declin*)).tw,kf.
56 or/44-55
57 16 and 43
58 16 and 56
59 57 or 58
60 59 not (exp animals/ not humans.sh.)

Grey Literature

Reports from the following brain injury, housing, and rehabilitation organizations will be searched:

- American Academy of Physical Medicine and Rehabilitation
- Canadian Alliance to End Homelessness
- Canadian Housing First Toolkit
- Centre for Urban Health Solutions
- Cochrane Methods Equity Homeless Health Guidelines
- Evidence Exchange Network for Mental Health Addictions
- Mental Health Commission of Canada
- Model Systems Knowledge Translation Center
- National Association of State Head Injury
- National Health Care for the Homeless Council
- National Institute on Disability, Independent Living and Rehabilitation Research (NIDILRR)
- National Rehabilitation Information Center
- Ruff Institute of Global Homelessness

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- The Center for Brain Injury Research and Training
- The Homeless Hub
- Toronto Alliance to End Homelessness
- Toronto Mental Health and Addictions Supportive Housing Network
- Wellesley Institute

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PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol*

Section and topic	Item No	Checklist item
ADMINISTRATIVE INFORMATION		
Title:		
Identification **PAGE 1 (SCOPING REVIEW)**	1a	Identify the report as a protocol of a systematic review
Update **N/A**	1b	If the protocol is for an update of a previous systematic review, identify as such
Registration **N/A**	2	If registered, provide the name of the registry (such as PROSPERO) and registration number
Authors:		
Contact **PAGE 1**	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author
Contributions **PAGE 24**	3b	Describe contributions of protocol authors and identify the guarantor of the review
Amendments **N?A**	4	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
Support:		
Sources **PAGE 24**	5a	Indicate sources of financial or other support for the review
Sponsor **PAGE 24**	5b	Provide name for the review funder and/or sponsor
Role of sponsor or funder **PAGE 24**	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol
INTRODUCTION		
Rationale **PAGE 4-7**	6	Describe the rationale for the review in the context of what is already known
Objectives **PAGE 7**	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)
METHODS		
Eligibility criteria **PAGE 11-12**	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review
Information sources **PAGE 10-11**	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage
Search strategy **PAGE 10-11, SUPPLEMENTARY FILE 1**	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated

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Study records:		
Data management **PAGE 12**	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review
Selection process **PAGE 12**	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)
Data collection process **PAGE 12-16**	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators
Data items **PAGE 12-16**	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications
Outcomes and prioritization **PAGE 16-17**	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale
Risk of bias in individual studies **PAGE 17**	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis
Data synthesis **PAGE 17**	15a	Describe criteria under which study data will be quantitatively synthesised
PAGE 17	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I^2, Kendall's τ)
N/A		
PAGE 17	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned
Meta-bias(es) **N/A**	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)
Confidence in cumulative evidence **N/A**	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)

*** It is strongly recommended that this checklist be read in conjunction with the PRISMA-P Explanation and Elaboration (cite when available) for important clarification on the items. Amendments to a review protocol should be tracked and dated. The copyright for PRISMA-P (including checklist) is held by the PRISMA-P Group and is distributed under a Creative Commons Attribution Licence 4.0.**

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BMJ Open

Protocol for a scoping review on rehabilitation among individuals who experience homelessness and traumatic brain injury

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Primary Subject Heading:	Rehabilitation medicine
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Keywords:	PUBLIC HEALTH, REHABILITATION MEDICINE, TRAUMA MANAGEMENT

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Protocol for a scoping review on rehabilitation among individuals who experience homelessness and traumatic brain injury

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ABSTRACT

Introduction: Rehabilitation is key to improving outcomes and quality of life after traumatic brain injury (TBI). However, individuals experiencing homelessness are rarely represented in research that informs evidence-based rehabilitation guidelines even though TBI is disproportionately prevalent among this population. This protocol is for a scoping review to explore the extent to which rehabilitation, including the types of rehabilitation interventions, is available to, or used by, individuals who experience homelessness and TBI to inform (a) opportunities to integrate rehabilitation for individuals who experience homelessness and TBI, (b) considerations for existing clinical and practice guidelines for rehabilitation, and (c) recommendations for future research.

Methods and analysis: The scoping review will be guided by six stages described in scoping review methodology frameworks. Electronic databases (MEDLINE, Embase and Embase Classic, Cochrane CENTRAL Register of Clinical Trials, CINAHL, APA PsycINFO, Applied Social Sciences Index and Abstracts, and Nursing and Allied Health), reference list of included articles and scoping or systematic reviews identified from the search, and grey literature, defined as reports from relevant brain injury, housing, and rehabilitation organizations, will be searched. Two reviewers will independently screen all articles based on pre-determined inclusion and exclusion criteria. A descriptive numerical summary of data items will be provided and qualitative content analytic techniques will be used to identify and report common themes. Preliminary findings will be shared with stakeholders to seek feedback on the implications of the results.

Ethics and dissemination: Ethics review will not be required, as only publicly available data will be analyzed. Findings from the scoping review will be published in a peer-reviewed journal and presented at scientific meetings and to stakeholders, defined as service providers in the housing and TBI sectors;

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health professionals who provide care for individuals with TBI and/or homelessness; health administrators, decision-makers, and policy-makers; researchers; and caregivers or family members of individuals with lived experience of TBI and homelessness.

Registration details: This protocol will be registered in the Open Science Framework (OSF) Registries.

Keywords: Traumatic brain injury, Rehabilitation, Homelessness, Underserved population, Vulnerable population

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STRENGTHS AND LIMITATIONS OF THIS STUDY

- To the best of our knowledge, this is the first scoping review of rehabilitation among individuals experiencing homelessness and TBI; findings will inform (a) opportunities to integrate rehabilitation for individuals who experience homelessness and TBI, (b) considerations for existing clinical and practice guidelines for rehabilitation, and (c) recommendations for future research
- This protocol is guided by scoping review methodology frameworks to improve methodological rigour, an identified limitation of existing rehabilitation scoping reviews, and describes a transparent approach to comprehensively identify literature on rehabilitation and TBI among underserved populations, which increases replicability
- Intersecting sex, gender, social identities, and vulnerabilities will be considered in the charting of the data, analysis, and reporting of findings
- We acknowledge the risk of publication bias because only peer-reviewed articles or published reports will be included
- To evaluate and report on the risk of publication bias, non-English articles will not be immediately excluded; the decision to include or exclude non-English language full-texts will be determined at the time of the review, taking into account the availability of resources and the proportion of non-English full-text articles

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INTRODUCTION

Homelessness is a global crisis affecting an estimated 100 million people worldwide and becoming increasingly prevalent in many countries.[1] In Canada, more than 200,000 individuals experience homelessness every year.[2] This number is based on a 2016 national report; however, recent studies suggest that the state of homelessness in the country is worsening.[3, 4] Individuals who experience homelessness suffer from a broad range of health concerns, including systemic disorders (e.g., chronic obstructive pulmonary disease, seizures, arthritis, musculoskeletal disorders, tuberculosis) and mental health conditions and substance use, all contributing to extremely high mortality rates.[5-7] Consistently underrecognized is traumatic brain injury (TBI). Defined as “an alteration in brain function or other evidence of brain pathology caused by an external force,”[8] TBI is a serious public health problem and the leading cause of death and disability among all trauma-related injuries globally.[9]

Approximately 1 in 2 individuals who are homeless or precariously housed experience a lifetime TBI while almost 1 in 4 individuals experience a moderate to severe TBI.[10] Evidence suggests that the relationship between TBI and homelessness is bidirectional, with TBI preceding and prolonging homelessness.[10-12] The first incidence of TBI was often found to occur before the onset of homelessness,[12] and moderate to severe TBI was associated with the initial loss of stable housing and a longer duration of homelessness and precarious housing.[11] Individuals with TBI often experience cognitive and behavioural challenges related to memory, attention, mental fatigue, and irritability; fatigue and balance problems; and an increased likelihood of developing neurologic and psychiatric conditions, all of which impact various areas of life and can be long-lasting or permanent.[13-17] Among those experiencing homelessness specifically, TBI has been found to be associated with poorer physical and mental health status, increased likelihood of seizures, mental health and substance use

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problems, higher risk for suicide, increased health service use, and increased criminal justice system involvement.[10, 18, 19] TBI-specific challenges, combined with other physical and mental health problems, and factors such as financial constraints and lack of social supports, lead to difficulties maintaining housing and increase the risk for homelessness. As the literature suggests, homelessness is a fluid experience characterized by frequent shifts in physical living situations (i.e., unsheltered, emergency, and provisionally accommodated) and changes in housing status (i.e., at risk of homelessness to experiencing homelessness).[20] If unaddressed, the effects of TBI and homelessness combined could lead to a cycle of repeated TBIs, prolonged homelessness, and substantial economic and health-related costs.[19, 21, 22]

The long-term negative outcomes of TBI, along with the intersecting challenges experienced by individuals who experience homelessness, demand long-term specialized supports including rehabilitation. Rehabilitation, defined as "a set of interventions designed to optimize functioning and reduce disability in individuals with health conditions in interaction with their environment," has been identified by the World Health Organization (WHO) as an integral part of the health care continuum; when integrated with primary healthcare, rehabilitation can reduce disability, optimize the outcomes of other interventions, and support full recovery.[23] Over the years, various rehabilitation interventions have been found beneficial in managing TBI symptoms and facilitating outcomes such as community integration and quality of life.[24, 25] The growing evidence base on TBI rehabilitation has informed the development of evidence-based guidelines that provide comprehensive recommendations for TBI care;[26] however, the research informing these guidelines do not sufficiently, if at all, represent underserved populations, such as individuals experiencing homelessness. Further, while reviews on TBI rehabilitation or clinical guidelines for homelessness exist,[24, 25, 27] there is none to date that focuses on rehabilitation interventions across disciplines for individuals who experience homelessness and TBI. This paucity of information suggests that existing evidence-based practice guidelines do not

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reflect rehabilitation that are specific to the needs of individuals who experience homelessness and TBI.

This protocol is for a scoping review that aims to address this gap, by exploring the extent to which rehabilitation, including types of rehabilitation interventions, is available to or used by individuals experiencing homelessness and TBI. This review will also aim to summarize findings across sex, gender, and other identity factors (e.g., age, race, ethnicity, and disability). To date, there is a lack of information across intersecting identities even though they contribute to unique experiences that cannot be addressed by looking at a single facet of identity.[28-31] The results of the scoping review will inform (a) opportunities to integrate rehabilitation for individuals who experience homelessness and TBI, (b) considerations for existing clinical and practice guidelines, and (c) recommendations for future research.

METHOD AND ANALYSIS

The scoping review will be guided by six stages described in Arksey and O'Malley's scoping review methodology framework and Levac and colleagues' additional recommendations to this framework[32, 33] – (1) identifying the research question, (2) identifying relevant studies, (3) selecting studies, (4) charting the data, (5) collating, summarizing, and reporting the results, and (6) consultation, which is an optional stage. The reporting of the scoping review will follow the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension or Scoping Reviews (PRISMA-ScR).[34]

Stage 1: Identifying the research question

The research question is: "To what extent is rehabilitation, including the types of rehabilitation intervention, available to, or used by, individuals experiencing homelessness and TBI?" As

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rehabilitation encompasses a variety of disciplines and homelessness a variety of living situations, the following parameters and definitions will guide the scoping review, including the search strategy, study selection, charting of data, and reporting of findings.

Rehabilitation will be defined using (a) the WHO's definition[35] and (b) rehabilitation teams identified in evidence-based guidelines for TBI rehabilitation.[26, 36] Homelessness will be defined using the Canadian Observatory of Homelessness (COH, formerly the Canadian Homelessness Research Network) typology of homelessness that encompasses the following physical living situations at the time of the research study: (a) unsheltered, (b) emergency sheltered, and (c) provisionally accommodated.[20] Table 1 illustrates the parameters and associated definitions for rehabilitation and homelessness that will guide the review.

Table 1. Parameters and associated definitions for rehabilitation and homelessness.

Concept	Parameter	Definition
Rehabilitation	World Health Organization's definition of rehabilitation[35]	"A set of interventions designed to optimize functioning and reduce disability in individuals with health conditions in interaction with their environment"
	Healthcare providers/professional disciplines identified in evidence-based clinical practice guidelines for rehabilitation[26, 36]	• Speech-language pathologists • Occupational therapist • Physiotherapist • Social worker • Neuropsychologist and psychometrist • Psychologist with expertise in behavioural therapy • Nurse • Physician and/or physiatrist • Rehabilitation support personnel • Nutritionist • Therapeutic recreationist
Homelessness[20]	Unsheltered	Individuals who lack housing and are not accessing shelters: • "Public or private spaces without consent or contract" or • "Places not intended for permanent human habitation"

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	Emergency sheltered	Individuals who cannot secure permanent housing and are accessing shelters or other system supports: • "Emergency overnight shelters for people who are homelessness" or • "Shelters for individuals/families impacted by family violence" or • "Emergency shelter for people fleeing a natural disaster or destruction of accommodation due to fires, floods, etc."
	Provisionally accommodated	Individuals without permanent shelter and are accessing accommodations that offer no prospect of permanent: • Interim housing • Living temporality with others • Accessing short-term, temporary rental without security of tenure • Living in institutional care and lack housing arrangements • Accommodation/reception centres for recently arrived immigrants and refugees

Stage 2: Identifying relevant studies

The comprehensive database search strategy proposed in this protocol was developed with an Information Specialist (JB) and involved iterative revisions with research team members who possess research and subject-matter expertise relevant to rehabilitation, TBI, and homelessness (see Supplementary File 1). The search strategy is developed for the MEDLINE® ALL (in Ovid, including Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily) database, and will be translated to: Embase and Embase Classic (Ovid), Cochrane CENTRAL Register of Clinical Trials (Ovid), CINAHL (EBSCO), APA PsycINFO (Ovid), Applied Social Sciences Index and Abstracts (Proquest), and Nursing and Allied Health (Proquest).

The following concepts were developed to form the search strategy:

A. Homelessness

B. Rehabilitation

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C. TBI or cognitive impairment

The final search strategy structure, (A + B) OR (A + C), will be used to search each database. No language or date limits will be placed on search strategies. In addition to comprehensive and structured database searching, reference list of included articles and scoping or systematic review articles identified from the search, and grey literature, defined as reports from relevant brain injury, housing, and rehabilitation organizations will be searched (see Supplementary File 1).

Stage 3: Study selection

To be included in the scoping review, peer-reviewed articles, grey literature, and reference list of included primary research articles and scoping or systematic reviews must meet the following inclusion criteria:

a) Describe and/or document rehabilitation and/or rehabilitation interventions that aim to optimize functioning and reduce disability in interaction with their environment or the delivery of care or describe and/or document rehabilitation services provided by healthcare providers/professional disciplines, as defined in Table 1;
b) Focus on individuals who are experiencing homelessness at the time of the research study, as defined in Table 1;
c) Include individuals with TBI; and
d) Report primary research findings.

Dissertations, conference proceedings, and articles that are narrative, commentaries, or describe a theory or framework without reporting primary research findings will be excluded. Articles that look at the broader brain-injured population (e.g., acquired brain injury) or individuals with cognitive impairment without specific mention of TBI will also be excluded.

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Relevant studies retrieved using the above search strategy will be imported into EndNote X8.2 for reference management and Covidence for deduplication and study selection.[37] Two reviewers will independently screen all articles based on the above inclusion and exclusion criteria. At the title and abstract screen, articles that do not explicitly mention cognitive impairment or TBI will be considered for the full-text screen to confirm the study include individuals with TBI. Prior to formal screening, pilot testing of 20 titles and abstracts will be conducted, until a minimum 80% agreement using the kappa statistic is achieved between the reviewers. At the full-text review, pilot testing of 10% of the full-text articles will be conducted until a minimum of 80% agreement is achieved between the reviewers. Non-English language abstracts will be assessed using the published English abstract and the decision to include these articles in the full-text articles will be determined at the time of the review, considering the availability of resources and proportion of non-English full-text articles. Any discrepancies during the study selection stage will be resolved by consensus or consultation with a third reviewer. The study selection process will be presented using the Preferred Reporting Items for Systematic Reviews and Meta Analyses flow chart.[34]

Stage 4: Charting the data

Table 2 presents the charting table for the scoping review, which will be continually refined, as recommended by Levac and colleagues' methodology framework.[33] One reviewer will independently complete the charting table for each study and the completed table will then be independently peer-reviewed by a second reviewer. Similar to the study selection stage, charting of the data will begin with a random sample of five articles until a minimum of 80% agreement is achieved between the reviewers. Discrepancies in charting the data will be resolved by consensus or in consultation with a third reviewer.

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Table 2. Charting table.

Data Item		Description
Study characteristics	Author	
	Year of publication	
	Country of study	
	Type of article	Note if the article was a peer-reviewed publication or grey literature
	Study design	Specify if the study was quantitative, qualitative, or mixed methods and describe the study design
	Objective	Describe the stated objective of the study
Study sample	TBI	Specify the definition of TBI or how TBI was identified/determined Specify the injury severity, time since injury, method of diagnosis/screening, timing of TBI relative to homelessness (e.g., whether TBI predated homelessness, if the individual was homeless at the time of TBI), and the sample (N, %) of individuals with TBI
	Homelessness	Specify the definition of homelessness Specify the sample (N, %) of individuals experiencing homelessness
	Age	Specify participants' age at the time of the study, at the time of TBI, and at the time of homelessness
	Sex/Gender	Specify if Sex- and Gender-Based Analysis Plus (SGBA+) was considered in the study design[38] Note if and/or how sex and gender were defined in the study. Specify the participants' sex and/or gender (N, %)
	Sociodemographic	Specify sociodemographic characteristics of the sample (e.g., race, ethnicity, religion, disability, geography, culture, income, education), including experiences consistent with those at risk of homelessness as defined in the COH [20] Note if/describe how the sample of individuals with homelessness and TBI intersect with the criminal justice/legal system or experienced violence, including intimate partner violence Note if/describe how the article acknowledged and/or accounted for intersecting social identities and/or vulnerabilities
Rehabilitation	Intervention	Describe the focus or goal of the intervention

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		Describe the rehabilitation approach/type of rehabilitation intervention, how the intervention was delivered, the length or frequency of the intervention, and the setting of/location in which the intervention(s) was/were delivered Note the theories or principles of care that are guiding the intervention studied in the article Note if/describe how the intervention acknowledged and/or accounted for intersecting social identities and vulnerabilities and housing status at the time of intervention
	Rehabilitation team	List the healthcare providers/professional disciplines that were involved in the intervention or rehabilitation process Note if the rehabilitation team collaborates with or have access to housing providers and other providers/disciplines not specified in Table 1
	Outcome	Describe the outcome of the intervention Note any outcome(s) relevant to intersectionality
	Barriers	Describe any stated barriers to rehabilitation for individuals experiencing homelessness and TBI
	Facilitators	Describe any stated facilitators to rehabilitation for individuals experiencing homelessness and TBI
	Gaps	Describe any stated gaps in research on rehabilitation for individuals experiencing homelessness and TBI

Stage 5: Collating, summarizing, and reporting the results

As recommended by Levac and colleagues' methodology framework,[33] stage 5 will follow three distinct steps that may be refined further towards the end of the review, based on the content of the included articles:

1. Analyzing the data – a descriptive numerical summary of study characteristics, study sample, rehabilitation, and barriers, facilitators, and gaps will be provided and qualitative content analytic techniques will be applied to inform steps 2 (reporting results) and 3 (applying meaning to the results);[39] this method of data analysis is appropriate for this review, as it allows for the quantification of data (i.e., taking into account the frequency of similar codes) in themes or category development.[40] Furthermore, we will assess the quality of the included studies using

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the Study Quality Assessment Tools designed by methodologists from the Research Triangle Institute International and the National Heart, Lung, and Blood Institute of the National Institutes of Health. These tools aim to assess the internal validity of a study, including sources of bias, confounding, study power, and other factors [41], to critically appraise different study designs. These quality assessments tools will be used to inform the process of applying meaning to the results, specified in step 3. No articles will be eliminated based on the quality assessment.

2. Reporting results – findings will be reported in relation to the research question (the extent to which rehabilitation, including the types of rehabilitation interventions, is available to, or used by, individuals who experience homelessness and TBI).
3. Applying meaning to the results – implications for (a) opportunities to integrate rehabilitation for individuals who experience homelessness and TBI, (b) considerations for existing clinical and practice guidelines for rehabilitation, and (c) recommendations for future research will be considered.

Stage 6: Consultation

Preliminary findings from stage 5 will be shared with stakeholders of this scoping review to identify additional literature and seek feedback on the implications of the review on (a) opportunities to integrate rehabilitation for individuals who experience homelessness and TBI, (b) considerations for existing clinical and practice guidelines for rehabilitation, and (c) recommendations for future research. Stakeholders include front-line staff and service providers in the housing and brain injury sectors; health administrators, decision-makers, and policy-makers; health professionals who provide care for individuals with TBI and/or individuals who experience homelessness; researchers and trainees who conduct research on rehabilitation, TBI, and homelessness; and caregivers or family members of individuals with lived experience of TBI and/or homelessness.

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Patient and public involvement

Patients and the public were not involved in the creation of this scoping review protocol. However, stage 6 of our proposed methods will engage stakeholders of this scoping review.

Ethics and Dissemination

Ethics review will not be required because only published and publicly available data will be analyzed. The scoping review will be published in a peer-reviewed journal. Findings will be presented at scientific conferences and stakeholders defined in stage six of the scoping review.

Strengths and Limitations

We acknowledge the risk of publication bias, as only peer-reviewed articles or published reports will be included. For example, pilot studies conducted as theses will not be captured in the scoping review unless they are published in peer-reviewed journals. However, this protocol aims to minimize publication bias by including non-English articles in the title and abstract screen using the published English version of the abstract. The decision to include or exclude non-English language full-texts will be determined at the time of the review, taking into account the availability of resources and proportion of non-English full-text articles. Furthermore, it is recognized that community organizations serving individuals experiencing homelessness and/or TBI may produce non-peer-reviewed reports of the services they offer. As such, grey literature, defined as reports published by brain injury, housing, and rehabilitation organizations, will also be searched. We also acknowledge that the inclusion of quality assessment deviates from the methodology frameworks used to inform this protocol [32, 33]. No studies will be excluded from this scoping review based on the quality assessment, however, results from the assessment will be considered when we apply meaning to the findings that are used to inform

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considerations for future research, the integration of rehabilitation, and clinical and best practices guidelines. Finally, this scoping review will not explicitly search for articles that only focus on individuals at risk of homelessness, defined as "people who are not homeless, but whose current economic and/or housing situation is precarious or does not meet public health and safety standard."[20] For example, articles that focus on precariously employed individuals without explicit mention of being unsheltered, emergency sheltered, and provisionally accommodated will not be included in this review. We acknowledge that homelessness is a fluid experience, with similar factors associated with unmet healthcare needs among those who are homeless and vulnerably housed. [42] However, the goal of this scoping review is to explore the extent to which rehabilitation, including the types of rehabilitation intervention, is available to, or used by individuals experiencing homelessness and TBI. Rehabilitation studies focused on individuals with TBI who are unsheltered, emergency sheltered, and provisionally accommodated at the time of the research study may describe a different rehabilitation experience than studies that focus on individuals at risk of homelessness or individuals with lived experience of homelessness who are in permanent housing. As such, this scoping review will not explicitly search for articles that only include individuals at risk of homelessness or who are currently in permanent housing. Instead, the charting and analysis of the data will identify and contextualize social determinants of health and other factors that put them at imminent risk of homelessness. It will also extract the definition of homelessness from the research study and note the location of the intervention(s). Future reviews on rehabilitation that are focused specifically on individuals at risk of homelessness, or specific populations at risk of homelessness, as well as studies focused on individuals with lived experience of homelessness and are in permanent housing are encouraged.

To the best of our knowledge, this is the first protocol for a scoping review on rehabilitation among individuals experiencing homelessness and TBI. This protocol is guided by scoping review

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methodology frameworks to improve methodological rigour, which also addresses an identified limitation of existing rehabilitation scoping review.[43] This protocol also describes a transparent approach to comprehensively identify literature on rehabilitation and TBI among underserved populations, which increases credibility and replicability. Importantly, intersecting sex, gender, social identities, and vulnerabilities, which are often overlooked in the literature, will be considered in the charting of the data, analysis, and reporting of findings. Findings from the scoping review will provide an evidence-based foundation to inform (a) opportunities to integrate rehabilitation for TBI for individuals experiencing homelessness, (b) considerations for existing clinical and practice guidelines, and (c) recommendations future research.

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AUTHORS' CONTRIBUTIONS

VC and AC conceptualized the study. VC, JE, and JB developed the search strategy. VC and JE formulated the design and drafted the manuscript. All authors critically reviewed the manuscript and approved the final manuscript.

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COMPETING INTERESTS

None declared.

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Supplementary File 1

Search Description

This strategy was first developed in Medline, and was then translated to other databases. It uses the following concepts:

- Concept A (lines 1-15): Homelessness
- Concept B (lines 17-42): Rehabilitation
- Concept C (lines 44-55): Traumatic brain injury or cognitive impairment

The search conducted is: (A + B) OR (A + C). This strategy was used in all searched databases. Searches were also limited to human studies when possible. No date or language limits were applied.

Search Strategy

Database: Ovid MEDLINE(R) ALL <1946 to April 20, 2021>

1 exp Homeless persons/
2 homeless*.tw,kf.
3 Roofless*.tw,kf.
4 (Marginal* adj3 hous*).tw,kf.
5 (precarious* adj3 hous*).tw,kf.
6 (unstabl* adj3 hous*).tw,kf.
7 (instab* adj3 hous*).tw,kf.
8 (interim* adj3 hous*).tw,kf.
9 (temporary adj3 (liv* or hous*)).tw,kf.
10 ((liv* or sleep* or stay or emergenc*) adj3 shelter??).tw,kf.
11 houseless*.tw,kf.
12 unsheltered.tw,kf.
13 rough sleeper?.tw,kf.
14 rough sleeping.tw,kf.
15 provisionally accommodat*.tw,kf.
16 or/1-15
17 "Physical and Rehabilitation Medicine"/
18 exp rehabilitation/
19 rehab*.tw,kf,jw.
20 telerehab*.tw,kf,jw.
21 neurorehab*.tw,kf,jw.
22 rh.fs.
23 Rehabilitation Centers/
24 (physiatrist? or physiatry).tw,kf.
25 occupational therapy/
26 (occupational adj therap*).tw,kf,jw.
27 physical therapy specialty/
28 (physical adj therap*).tw,kf,jw.
29 physiotherap*.tw,kf,jw.
30 physio-therapist*.tw,kf,jw.
31 Speech-Language Pathology/
32 (speech adj2 (therap* or patholog*)).tw,kf,jw.
33 Neuropsychology/

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34 Neuropsycholog*.tw,kf,jw.
35 Nutritionists/
36 (Nutritionist? or Dietician?).tw,kf,jw.
37 (therap* adj recreation*).tw,kf,jw.
38 child life specialist?.tw,kf.
39 play therapy/
40 (play adj therap*).tw,kf.
41 Respite Care/
42 respite.tw,kf.
43 or/17-42
44 exp Brain Injuries/
45 exp Brain Injuries, Traumatic/
46 exp Brain Concussion/
47 Craniocerebral Trauma/
48 tbi*2.tw,kf.
49 mtbi*2.tw,kf.
50 concuss*.tw,kf.
51 postconcuss*.tw,kf.
52 ((head* or brain* or cerebr* or crani* or skull* or intracran*) adj2 (injur* or trauma* or damag* or wound* or swell* or oedema* or edema* or fracture* or contusion* or pressur*)).tw,kf,jw.
53 ((brain* or cerebr* or intracerebr* or crani* or intracran* or head* or subdural* or epidural* or extradural*) adj (haematoma* or hematoma* or hemorrhag* or haemorrhag* or bleed*)).tw,kf.
54 exp cognition disorders/
55 ((cogniti* or neurocogniti*) adj2 (impair* or dysfunction* or disorder* or declin*)).tw,kf.
56 or/44-55
57 16 and 43
58 16 and 56
59 57 or 58
60 59 not (exp animals/ not humans.sh.)

Grey Literature

Reports from the following brain injury, housing, and rehabilitation organizations will be searched:

- American Academy of Physical Medicine and Rehabilitation
- Canadian Alliance to End Homelessness
- Canadian Housing First Toolkit
- Centre for Urban Health Solutions
- Cochrane Methods Equity Homeless Health Guidelines
- Evidence Exchange Network for Mental Health Addictions
- Mental Health Commission of Canada
- Model Systems Knowledge Translation Center
- National Association of State Head Injury
- National Health Care for the Homeless Council
- National Institute on Disability, Independent Living and Rehabilitation Research (NIDILRR)
- National Rehabilitation Information Center
- Ruff Institute of Global Homelessness

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- The Center for Brain Injury Research and Training
- The Homeless Hub
- Toronto Alliance to End Homelessness
- Toronto Mental Health and Addictions Supportive Housing Network
- Wellesley Institute

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PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol*

Section and topic	Item No	Checklist item
ADMINISTRATIVE INFORMATION		
Title:		
Identification **PAGE 1 (SCOPING REVIEW)**	1a	Identify the report as a protocol of a systematic review
Update **N/A**	1b	If the protocol is for an update of a previous systematic review, identify as such
Registration **N/A**	2	If registered, provide the name of the registry (such as PROSPERO) and registration number
Authors:		
Contact **PAGE 1**	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author
Contributions **PAGE 24**	3b	Describe contributions of protocol authors and identify the guarantor of the review
Amendments **N?A**	4	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
Support:		
Sources **PAGE 24**	5a	Indicate sources of financial or other support for the review
Sponsor **PAGE 24**	5b	Provide name for the review funder and/or sponsor
Role of sponsor or funder **PAGE 24**	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol
INTRODUCTION		
Rationale **PAGE 4-7**	6	Describe the rationale for the review in the context of what is already known
Objectives **PAGE 7**	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)
METHODS		
Eligibility criteria **PAGE 11-12**	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review
Information sources **PAGE 10-11**	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage
Search strategy **PAGE 10-11, SUPPLEMENTARY FILE 1**	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated

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Study records:		
Data management **PAGE 12**	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review
Selection process **PAGE 12**	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)
Data collection process **PAGE 12-16**	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators
Data items **PAGE 12-16**	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications
Outcomes and prioritization **PAGE 16-17**	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale
Risk of bias in individual studies **PAGE 17**	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis
Data synthesis **PAGE 17**	15a	Describe criteria under which study data will be quantitatively synthesised
PAGE 17	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I^2, Kendall's τ)
N/A	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)
PAGE 17	15d	If quantitative synthesis is not appropriate, describe the type of summary planned
Meta-bias(es) **N/A**	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)
Confidence in cumulative evidence **N/A**	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)

*** It is strongly recommended that this checklist be read in conjunction with the PRISMA-P Explanation and Elaboration (cite when available) for important clarification on the items. Amendments to a review protocol should be tracked and dated. The copyright for PRISMA-P (including checklist) is held by the PRISMA-P Group and is distributed under a Creative Commons Attribution Licence 4.0.**

From: Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart L, PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ. 2015 Jan 2;349(jan02 1):g7647.

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