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# **The Surgical Care of Homeless Patients: A Scoping Review Using a Phases of Care**

## **Conceptual Framework**

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**Key Points (100/100 words)**

**Question:** What is the current state of literature regarding the surgical care of homeless patients?

**Findings:** In this systematic scoping review of 23 studies, a Phases of Care framework was developed to organize evidence unique to the surgical care of homeless patients, a vulnerable and growing population. Selected studies were heterogeneous and limited, particularly regarding the impact of housing status on surgical or anesthetic approach. Definitions of homelessness varied or were absent across studies.

**Meaning:** Research on optimal surgical care for the homeless is sparse. A key next step is recording housing status in surgical databases using a standardized definition.

**Abstract (348/350 words)**

**Importance:** Homelessness is a growing concern across the world, with homeless individuals facing a rising burden of chronic health conditions. Although substantial research has focused on the medical and psychiatric care of patients experiencing homelessness, review of the surgical literature about the care of homeless patients and identification of the gaps in the field is lacking.

**Objective:** To review the literature in order to identify areas of concern unique to surgical homeless patients that should be accounted for during the surgical care episode.

**Evidence Review:** A scoping review was conducted using a comprehensive database search in PubMed, Embase, Web of Science, and Cochrane Center Register for Clinical Trials from 1990 to September 1, 2020. Studies with patients who were homeless and/or unhoused and specifically discussed the surgical care of these homeless patients were included. The inclusion criteria were designed to identify evidence that directly impacted surgical care, systems management, and policy making. Article identification and data abstraction were performed by two independent researchers. Findings were organized within the Phases of Surgical Care framework: 1) pre-operative care, 2) intra-operative care, 3) post-operative care, and 4) overall care utilization

**Findings:** Our search strategy yielded 553 unique studies, of which 466 were eliminated through title and abstract screening. Of the 87 remaining studies, 23 studies met the inclusion criteria and were included in the review. Most studies were performed at public and/or safety-net hospitals or

via national registries, and surgical areas of focus included orthopedic, cardiac, plastic surgery trauma, and vascular surgery. Using the Phases of Care framework, we identified a handful of studies that described the impact of housing status in pre-operative, post-operative, and overall care utilization. Gaps were identified in description of the intra-operative care like surgical or anesthetic approach. The majority of studies (52.2%) did not define homelessness for the purposes of their study.

**Conclusions and Relevance:** There is a gap in the surgical literature regarding the impact of housing status on all phases of surgical care with the largest gap in intra-operative surgical and anesthetic decision making. Consistent utilization of standardized homeless definitions are lacking. To promote improved care for homeless patients, standardized approaches for collecting housing status from patients as well as studies identifying vulnerabilities in surgical care unique to this population must be identified.

## **Introduction**

In the United States, an estimated 568,000 people experienced homelessness in 2019.<sup>1</sup> Homeless individuals face a disproportionate burden of chronic health conditions, including cardiovascular and metabolic disease, substance use disorders, and mental illness.<sup>2,3</sup> Not only is the homeless population aging overall, but homeless people are hospitalized at younger ages compared to housed individuals, resulting in higher healthcare utilization compared to housed patients.<sup>4-8</sup> Homeless patients are a vulnerable population and disparities in healthcare utilization and outcomes are likely multifactorial, ranging from barriers to accessing primary and preventative care to high rates of food insecurity, drug and alcohol use, and concomitant mental illness.<sup>3,9-15</sup>

Although numerous studies have focused on medical and psychiatric diseases in the homeless population, there is a dearth of reports around the surgical care of these patients. Housing status impacts the approach to surgical care along the entire continuum from preoperative preparation to surgical decision-making and post-operative care. Cancer diagnoses occur later and at more advanced stages because of barriers to accessing primary care and screening, potentially constraining surgical options. Similarly, surgical approach and choice of anesthesia may be impacted by a patient's functional limitations, history of substance use, and chronic health conditions, all of which are more common in homeless populations.<sup>16-19</sup> Finally, post-operative care like wound care or ostomy training can be challenging without access to

basic needs such as shelter, hygiene, and nutrition, which may impact hospital readmission and follow-up care coordination.<sup>20-23</sup>

To begin to understand the landscape and gaps in knowledge, we hypothesized that a systematic review of the literature would identify gaps and define next steps in improving the surgical care of homeless patients. Our aim was to describe the breadth of published evidence on how housing status affects surgical patients, develop a framework to understand and map this evidence, and to identify gaps in the literature as a call-to-action for future research.

## **Methods**

### *Literature Search and Study Selection*

In this scoping review, we conducted a comprehensive database search regarding the surgical care of homeless patients in PubMed, Embase, Web of Science, and Cochrane Central Register for Clinical Trials from 1990 to September 1, 2020. The search strategy consisted of two main concepts: homelessness and surgical care (eTable 1). Our findings are reported in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) guidelines.<sup>24</sup>

Studies were included if they 1) included study participants who were homeless and/or unhoused, and 2) discussed surgical care for homeless patients. Surgical care was broadly defined as care relating to procedures that occur in an operating room or endoscopic unit under any type of anesthesia. Two authors (M.K.A. and H.S.) independently performed title and abstract review, selecting studies for full text review based on inclusion and exclusion criteria. Discrepancies were settled by a third author (J.L.). Review articles, case reports, editorials, conferences proceedings, and studies that were not available online or in English were excluded.

Studies that were performed outside of the United States, the United Kingdom, or Canada were also excluded. While the included countries feature different healthcare structures, the challenges facing their respective homeless populations were felt to be generalizable to each other.

Epidemiologic studies describing homeless populations without direct assessment of surgical care and cancer screening studies in which surgical intervention was not reported were also excluded.

### *Development of Framework*

We developed a conceptual framework to understand the impact of homelessness on surgical care. The framework was produced based on the included studies and the methodology proposed by Jabareen.<sup>25</sup> In parallel with the steps of our literature search, including developing search terms, title and abstract review, full text review, and definition of inclusion and exclusion criteria, we iteratively developed concepts to organize candidate studies using a grounded theory approach. Themes were developed from data within candidate studies and identified as concepts. Concepts were synthesized into a conceptual framework and validated internally based on consensus between the authors.

### *Data Extraction*

A standardized data abstraction form was used to extract data from all included studies. Studies were categorized using the Phases of Care framework we developed. Extracted data included location of study, study design and methods, description of study population, definition of homelessness used, surgical interventions performed, and key outcomes and findings



(Supplemental Table 2). Two authors (M.K.A. and H.S.) independently performed the data extraction, and data were validated through discussion and consensus.

## **Results**

### *Included Studies*

Our initial search of the four databases yielded 838 studies, with 553 unique studies included after duplicate manuscripts were removed. Of these studies, a total of 87 were selected for full text review based on title and abstract screening. Of these 87 studies, 64 were excluded from our analysis, of which 27 did not meet inclusion criteria, 13 were case reports or editorials, 11 were not performed in the United States, United Kingdom, or Canada, 2 included deceased organ donors, 7 did not differentiate between patients with medical conditions and surgical conditions, 1 only surveyed surgical providers, and 3 did not have full article available. After excluding these studies, 23 papers were included for review (Figure 1).

Study characteristics are shown in Table 1.<sup>21,26-46</sup> The majority came from the United States (n=19, 82.6%), followed by Canada (n=3, 13.0%) and the United Kingdom (n=1, 4.3%). Surgical areas of focus included orthopedic, cardiac, plastic surgery trauma, and vascular. A total of 57,211 homeless patients were included in the studies, with the largest study having 24,890 homeless patients. Most studies utilized national registries including the National Readmission Database, Nationwide Inpatient Sample, Vascular Quality Initiative, and the New York Statewide Planning and Research Cooperative System, accounting for 6 studies and 37,466 patients. Additionally, many studies took place at Veterans Affairs hospitals (4 studies, 6,816

patients) or public/safety-net hospitals (2 studies, 337 patients). The majority of studies (n=12, 52.2%) lacked a clear definition of homelessness. Even when described, the definitions varied, including: living on the street, with friends, or in a shelter, transitional housing, or tent; lack of adequate nighttime residence; lack of address on intake forms; and specific International Classification of Diseases (ICD)-9 and ICD-10 codes identifying homelessness.

### *Phases of Care Framework*

Based on our grounded theory approach to categorizing the included studies, we developed a framework based on phases of care: 1) pre-operative risk factors, 2) intra-operative care, 3) post-operative care, and 4) overall utilization and access to care. Pre-operative care included care processes around preoperative optimization to improve surgical outcomes and preparing for surgery. Intra-operative care included operative approach and anesthetic plan. The domain of post-operative care included in-hospital care, length of stay, discharge, follow-up, readmission, and complications of surgery. The domain of overall utilization and access encompassed measures of obtaining and utilizing care. We chose this framework because it provided a logical and clear way of organizing and aggregating findings across studies performed in a variety of settings, specialties, and locations. We also felt the application of the framework to the data would identify actionable data and deficits in the literature.

### *Domain 1: Pre-Operative Risk Factors*

The first domain of the Phases of Care framework encompasses literature regarding the underlying conditions and risk factors that impact the surgical course of decision making (Table 2). The majority of the studies included in this domain focused on housing status as an epidemiologic risk factor for presenting with surgical disease. Two studies found that homeless

patients undergoing total hip or knee arthroplasty were up to 14 times more likely to be co-infected with HIV or Hepatitis C, which was in turn an independent risk factor for increased length of stay, complications, hospital charges, and re-admission rates.<sup>29,30</sup> Intravenous drug use and alcohol dependence were also common in the homeless population, including those who needed cardiac surgery, arteriovenous (AV) access creation, and plastic surgery.<sup>28,34,35</sup> Homeless patients were more likely to have MRSA-associated hand infections that required surgery compared to non-MRSA-associated hand infections.<sup>45</sup> Finally, homeless patients who presented with facial fractures were more likely to require surgery for these fractures compared to housed patients, even after adjusting for confounding variables like sex, age, and current drug or alcohol use.<sup>32</sup>

Interestingly, the search did not yield any studies describing feasibility of evidence-based preoperative process associated with improved surgical outcomes, including mechanical bowel preparation with oral antibiotics prior to colorectal surgery, pre-habilitation, or chronic pain management.

### *Domain 2: Intra-Operative Care*

Only one study fell into the intra-operative domain of the Phases of Care framework, which captured the impact of homelessness on operative management, choice of anesthesia, and length of the surgical procedure. Wong et. al. reported a small retrospective study of 34 patients undergoing distal or central splenorenal shunts, five of whom were homeless and 19 of whom were unemployed.<sup>39</sup> The authors concluded that splenorenal shunt could be used for patients who have limited access to endoscopy, transjugular intrahepatic portosystemic shunt,

ultrasonography, or liver transplantation with acceptable morbidity and mortality rates. No studies described choice of anesthesia for homeless patients.

### *Domain 3: Post-Operative Care*

The third domain of the Phases of Care framework captured studies on post-operative care and follow-up of homeless patients. The majority of studies reported high readmission and complication rates in homeless populations. For example, Arceo et. al. found that homeless patients had increased utilization of emergency department services in the immediate post-operative setting following lower extremity fracture surgery, and Wasfy et. al. found that homeless patients were more likely to be readmitted following percutaneous coronary intervention (PCI) than those who were housed.<sup>26,38</sup> With respect to complications, two studies reported high rates of treatment failure and amputation for orthopedic injuries, including open reduction and internal fixation for ankle fracture and foot osteomyelitis.<sup>40,47</sup> A study by Titan et. al. found that homeless patients undergoing general, vascular, and orthopedic surgeries at the Veterans Health Administration were more likely to be readmitted, particularly those who were discharged to the community after surgery.<sup>21</sup> While homelessness presented challenges in the post-operative phase, there were some reports with equivalent outcomes in the housed and non-housed groups. Homeless patients who underwent total joint arthroplasty had high rates of orthopedic and radiographic follow-up with minimal re-operation rates.<sup>41</sup> Additionally, in Canada, homeless patients in Canada who were admitted to a 20-bed shelter-based convalescence following surgery or medical procedure had exceptionally high rates of applying for permanent housing, and 24.3% of those patients received housing following their admission.<sup>33</sup>

#### *Domain 4: Overall Care Utilization*

Finally, eight studies spanned the pre-, intra-, and post-operative domains and described overall care utilization and access to surgical care for homeless patients. Four of these studies evaluated the use of surgical interventions in homeless populations and found that homeless patients were less likely to receive surgery for burns, orthopedic trauma, and myocardial infarction.<sup>27,36,37,46</sup> Similarly, homeless patients were less likely to pursue surgical clinic visits and more likely to miss appointments for endoscopic procedures requiring anesthesia in safety-net and Veterans Affairs settings.<sup>42,43</sup>

Hwang et. al. found that homelessness was associated with increased cost of admission for surgical interventions in Canadian hospitals; however, this difference was not statistically significant, unlike inpatient stays for medical interventions.<sup>44</sup> A 2019 study found that homeless patients undergoing emergency general surgery and living in non-Medicaid expansion states had higher charges, increased mortality, and more surgical complications.<sup>31</sup> There was only one publication that focused on mortality differences between homeless and housed populations following surgery, finding that homeless adults with ST-elevation myocardial infarction or stroke had a higher risk-standardized mortality than non-homeless persons and were less likely to undergo coronary angiography, PCI, and coronary artery bypass grafting (CABG).<sup>36</sup>

#### **Discussion**

In this systematic scoping review, we summarize the literature around surgical care of homeless populations and develop a framework for understanding and mapping the literature. Overall, only 23 studies met our inclusion criteria, which we designed to select for evidence that

would impact direct surgical care, systems management, and policy making for this vulnerable population. Our Phases of Care framework revealed that published studies largely describe the impact of housing status in the Pre-Operative Risk Factors, Post-Operative Care, and Overall Care Utilization domains. There was a noticeable dearth of literature focusing on surgical and anesthesia approaches. Only one study regarding the use of splenorenal shunts for portal hypertension described intra-operative surgical decision-making affected by housing status. However, numerous common operative decisions are likely impacted by housing status, with little evidence to guide them, including ostomy creation versus avoidance, adjuvant therapy and reconstruction for breast cancer, or hernia prevention and management.

MAYBE THIS IS A PARAGRAPH ABOUT THE NEED TO UNDERSTAND THE EPIDEMIOLOGY OF SURGICAL DISEASES IN THE HOMELESS (E.G. TYPES OF DISEASE PRESENT, WHAT STAGE THEY PRESENT AT ETC, EMERGENCY VS ELECTIVE PRESENTATION ETC) Many of the studies presented focused on orthopedic, cardiac, plastic surgery trauma, and vascular surgeries, while more common surgical procedures like colon, breast, hernia, or gynecologic surgeries were not well represented. All were retrospective cohort or cross-sectional studies. Much of the identified literature was performed at a single institution, although some studies utilized data from large, national registries, including the largest with 24,890 individuals.<sup>36</sup>

In this review, we chose to focus on identifying studies that were likely to impact surgical decision making at the level of individual patient care, care systems, or healthcare policy. Thus, we excluded studies relating to the epidemiology of surgical care in homeless populations, as we felt that articulating the prevalence of certain surgical conditions in homeless populations, while vitally important, would not directly impact surgical management. Similarly, we did not include

cancer screening studies that did not directly discuss the subsequent surgical care of patients who were screened for cancer. A number of cancer screening studies were identified in our initial search strategy, including those regarding colon, cervical, and breast cancer screening in homeless population.<sup>48-55</sup> These studies often cited low rates of cancer screening in homeless populations, particularly in minority populations; moreover, individuals who were screened in certain studies were not typically aware of their results, and positive screening largely did not lead to increased uptake of confirmatory testing with methods like colonoscopy.<sup>48,52</sup> Interestingly, despite the substantial literature on the topic of cancer screening, we did not identify any scoping, systematic reviews, or meta-analyses about cancer screening protocols in homeless populations in our search, thereby representing a compelling and impactful future area of research.

Housing status is a significant upstream determinant of access to healthcare and health outcomes through multiple mechanisms. Programs that increase access to housing have shown to improve access to health care and reduce health care utilization, costs, and patient mortality. However, a major barrier in understanding the impact of homelessness on surgical care is the lack of a standardized definition of homelessness, which we identified in our scoping review. Only three studies utilizing ICD codes to identify homeless individuals. Without consistent recognition and documentation of housing status within the electronic medical record or large databases, it will continue to be challenging to identify homeless patients, evaluate health outcomes, and actively engage in initiatives that improve care of this unique population, whether within surgical specialties or more broadly. Organizations like the Centers for Medicare and Medicaid Services (CMS), the Center for Disease Control (CDC)'s National Center for Health Statistics (NCHS), and the National Health Care for the Homeless Council have developed

guidelines and initiatives centered around the appropriate coding of housing status within the electronic medical record, citing the importance of such documentation for both short- and long-term health benefits.<sup>56</sup> There are also state-level policies that are being developed with similar goals. For example, the California state legislature recently passed the Senate Bill (SB) 1152, which seeks to improve reporting of patient housing status and safe discharging of homeless patients following hospitalization.<sup>57</sup> Documentation of housing status using standardized coding procedure, like the recently developed Z59.0 ICD-10 CM coding, is an essential first step both for improving clinic care and research to deepen our understanding. Interestingly, the U.S. Department of Veterans Affairs' National Center on Homelessness Among Veterans has developed a two-question screen for homelessness and risk of homelessness, which may facilitate the research coming from these institutions identified in this scoping review.

[See comment](#)

There were a number of topics relating to the surgical care of homeless patients that were noticeably absent from the scoping review and present areas of future research. To our knowledge, there were no studies that focused on colorectal surgery, particularly with respect to colorectal resections in which diversion is considered. A pertinent and compelling area of study is whether the additional burden of ostomy care for homeless patients may or may not outweigh the risk of complications if no diversion is performed. Additionally, although it is well established that homelessness is associated with delays in breast cancer screening and receipt of care, several significant questions regarding intra-operative and post-operative surgical care remain unanswered. For example, it is unclear whether partial mastectomy with radiation and additional follow-up would be feasible and effective compared to mastectomy with only routine follow-up care in homeless populations. Similarly, the choice of post-mastectomy breast



reconstruction technique for homeless patients remains understudied, with flap surgery likely requiring less follow-up compared to tissue expanders. In a non-cancer setting, the extent to which homelessness is a contributor to inguinal, ventral, or incisional hernias or their recurrence is also unclear. These areas of research represent only a narrow window into the remaining unanswered questions regarding the surgical care of homeless populations, and more research in these and other domains is needed.

### *Strengths and Limitations*

We believe that this systematic scoping review is an important addition to the literature on the care of homeless patients, as it describes the current but limited literature on surgical care of homeless patients and presents areas for improvement in the field. Additionally, we describe a new framework that links important issues in the care of homeless populations to phases of surgical interventions along a continuum, and we believe that this framework will improve future work in this field. However, our research has several limitations. As described previously, the substantial heterogeneity with respect to type of surgical intervention, surgical subspecialty, and hospital setting limits our ability to identify broad recommendations and conclusions about the surgical care of homeless patients. We were also limited by the varied and inconsistent definition of homelessness across the studies, and it is possible that some studies identified in this review were subject to ascertainment bias due to these issues. Finally, despite a rigorous search of the primary literature, it is possible that some studies relevant to our area of research were not included in our analysis.

### **Conclusions**

This systematic scoping review suggests that research regarding the surgical care of homeless patients is substantially heterogeneous and limited, particularly with respect to intra-operative decision making. Definitions of homelessness across studies were inconsistent, presenting an area of future study and advocacy that has the potential to greatly improve research in this field. More studies are needed to accurately characterize the surgical care of homeless patients and identify areas for care improvement.

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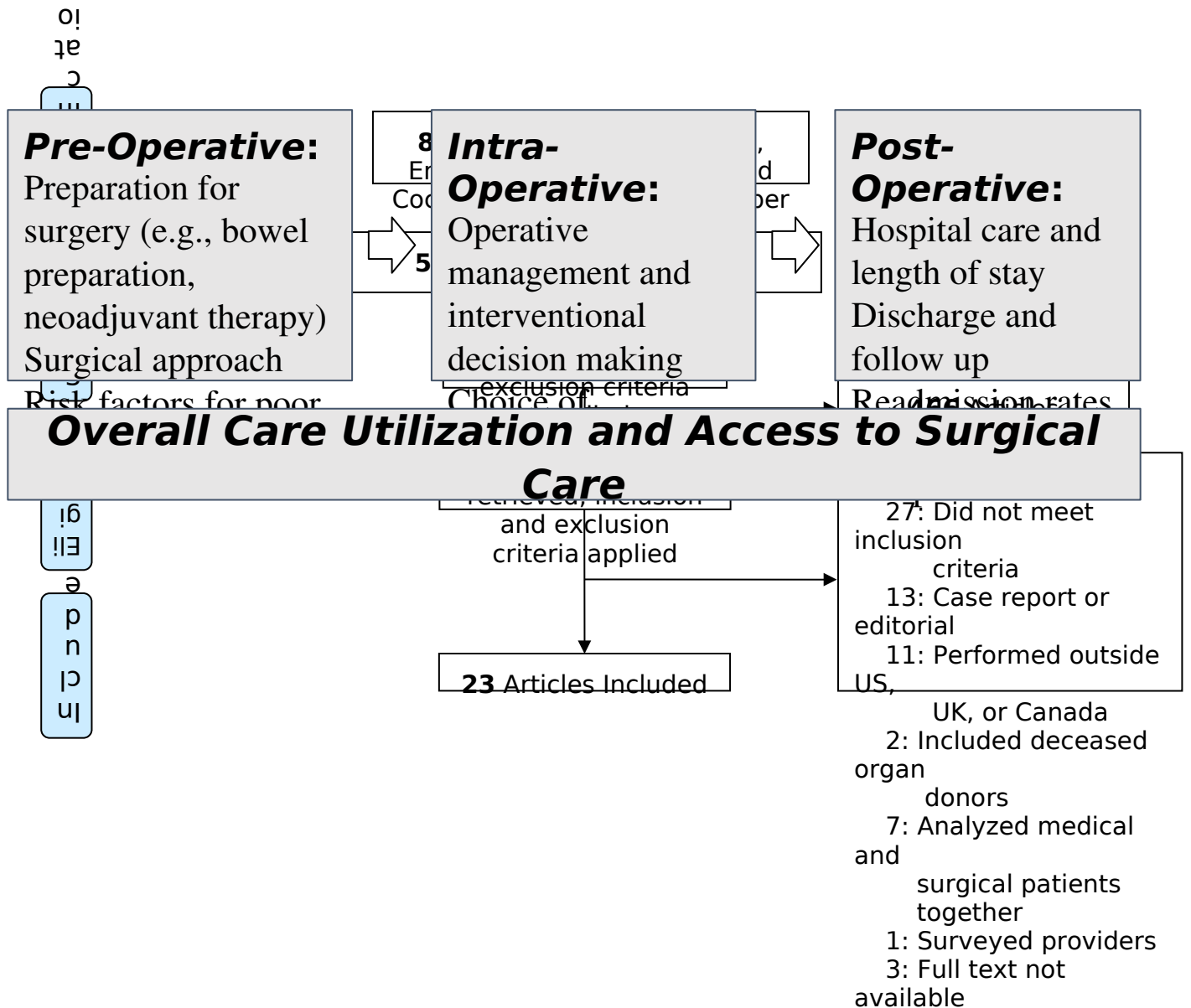
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Figure 1: PRISMA Flow Diagram

Legend: PRISMA indicates Preferred Reporting Items for Systematic Reviews and Meta-Analyses

Figure 2: Phases of Care Framework



Legend: Phases of Care framework dividing surgical care into pre-operative, intra-operative, post-operative, and overall care utilization and access to surgical care domains.

Table 1: Characteristics of studies included in analysis

Source	Country	Surgery or Condition Requiring Surgery	Institution Type	No. Homeless (% of Study)	Definition of Homelessness
Arceo et. al. 2018	United States	Orthopedic Surgery	Academic Center	19 (3%)	No definition
Balla et. al. 2020	United States	Cardiac Surgery	Registry	3,938 (0.4%)	ICD-9 V60.0 and ICD-10 Z59.0
Barshes et. al. 2016	United States	Orthopedic Surgery	Veterans Affairs	9 (5%)	No definition
Bennett et. al. 2017	United States	Orthopedic Surgery	Veterans Affairs	33 (100%)	Living in shelter, motor vehicle, hotel, friend's home, or tent
Chang et. al. 2015	United States	Endoscopy	County Hospital	62 (12.1)	No definition
Gabrielian et. al. 2014	United States	Multiple	Veterans Affairs	1,706 (3%)	ICD-9 V60.0 or accessed homeless services
Hwang et. al. 2011	Canada	Multiple	Academic Center	3,081 (3%)	Specific indicator for homeless, lack of address, or shelter address
Imahara et. al. 2010	United States	Surgical Hand Infections	Academic Center	51 (32%)	No definition
Kay et. al. 2014	United States	Orthopedic Surgery	Academic Center	63 (50%)	Patient listed "homeless" on intake forms
Kiwanuka et. al. 2019	United States	Plastic Surgery Trauma	Registry	332 (0.8%)	ICD-9 V60.0, V60.1, and V60.9
Levin et. al. 2020	United States	Vascular Surgery	Registry	78 (0.2%)	No definition
Mahure et. al. 2017	United States	Orthopedic Surgery	Registry	388 (0.5%)	No definition
Mahure et. al. 2018	United States	Orthopedic Surgery	Registry	910 (0.7%)	No definition
Manzano-Nunez et. al. 2019	United States	General Surgery	Registry	6,930 (100%)	No definition
Nguyen et. al. 2019	United States	Plastic Surgery Trauma	County Hospital	275 (12%)	No address (living on street or shelters)
Podymow et. al. 2006	Canada	Multiple	Shelter-Based Unit	140 (100%)	No definition
Skillman et. al. 2011	United Kingdom	Plastic Surgery Trauma	National Healthcare System	9 (12%)	No definition
Thakarar et. al. 2019	United States	Cardiac Surgery	Academic Center	10 (9%)	Living on street, shelter, transitional housing, staying with friends, or documentation of homelessness in EHR
Titan et. al. 2018	United States	Multiple	Veterans Affairs	5,068 (2%)	Lack adequate nighttime residence (defined by Homeless Emergency Assistance and Rapid Transition to Housing Act of 2009)
Wadhera et. al. 2020	United States	Cardiac Surgery	Registry	24,890 (1%)	Based on Healthcare Cost and Utilization Project State Inpatient Database
Wasfy et. al. 2015	United States	Cardiac Surgery	Academic Center	56 (2%)	No definition
Wolfstadt et. al. 2019	Canada	Orthopedic Surgery	Mixed	9,158 (20%)	Quintile 5 of Ontario Marginalization Index (no homeless definition)
Wong et. al. 2002	United States	GI Surgery	Unknown	5 (18%)	No definition

ICD = International Classification of Diseases, PCI = percutaneous coronary intervention

Table 2: Studies organized by Phases of Care domains and key findings

Domain of Framework	Source	Key Findings
Pre-Operative	Imahara et. al. 2010	Homeless patients were more likely to have <i>MRSA</i> -associated surgically treated hand infection compared to non- <i>MRSA</i> -associated infections.
	Levin et. al. 2020	Of patients undergoing arteriovenous access creation, those with history of <i>intravenous drug use</i> were more likely to be homeless than those without this history.
	Mahure et. al. 2017	Among patients undergoing total knee arthroplasty, those who were homeless were more likely to be mono-infected or co-infected with <i>HIV and/or HCV</i> .
	Mahure et. al. 2018	Among patients undergoing total hip arthroplasty, homelessness was 14 times higher in those who were co-infected with <i>HIV and HCV</i> compared to controls.
	Nguyen et. al. 2019	After adjusting for confounding variables, homeless patients with facial fractures were more likely to <i>require surgery</i> for these fractures compared to housed patients.
	Skillman et. al. 2010	Twelve percent of individuals with <i>drug and alcohol dependence</i> treated for plastic surgery trauma were homeless.
	Thakarar et. al. 2019	People with <i>injection drug use</i> were more likely to be homeless but had similar rates of cardiac surgery.
Intra-Operative	Wong et. al. 2002	Of patients undergoing <i>splenorenal shunt</i> , 14.7% were homeless. Splenorenal shunt could be an ideal procedure for patients who have limited access to tertiary medical centers or have complex psychosocial needs.
Post-Operative	Arceo et. al. 2018	Homeless patients had <i>increased utilization</i> of the emergency department in post-operative period following ballistic and non-ballistic long bone lower extremity fracture surgery.
	Barshes et. al. 2016	Homelessness was associated with <i>increased risk of treatment failure and amputation</i> for foot osteomyelitis.
	Bennett et. al. 2017	Homeless patients in a VA healthcare system who underwent total joint arthroplasty had <i>high rates of orthopedic and radiographic follow-up</i> at three and six months with minimal complications and reoperations.
	Podymow et. al. 2016	Twelve percent of patients admitted to shelter-based convalescence were post-surgical patients. During admission, 60% of patients <i>applied for housing</i> and 24.3% received housing.
	Titan et. al. 2018	Homeless patients undergoing general, vascular, or orthopedic surgery were more likely to be <i>readmitted</i> . Discharge destination and <i>recent alcohol abuse</i> were significant risk factors for readmission in homeless cohort.
	Wasfy et. al. 2015	Homeless patients were more likely to be <i>readmitted</i> following PCI <sup>1</sup> compared to housed patients.
	Wolfstadt et. al. 2019	Higher level of deprivation on the Ontario Marginalization Index was associated with <i>increased risk of irrigation and debridement and amputation</i> following open reduction and internal fixation for ankle fracture.

<b>Overall Care Utilization</b>	Balla et. al. 2020	Homeless patients were <i>less likely to have surgical interventions</i> (angiography, PCI <sup>1</sup> , CABG <sup>2</sup> ) following myocardial infarction and had <i>longer hospitalizations</i> .
	Chang et. al. 2015	Patients who <i>missed appointments</i> for endoscopic procedures requiring anesthesia were more likely to be homeless
	Gabrielian et. al. 2014	Homeless veterans were <i>less likely to pursue surgical visits</i> compared to housed veterans.
	Hwang et. al. 2011	Homelessness was associated with <i>increased cost of admission</i> (driven by longer length of stay) for surgical admissions.
	Kay et. al. 2014	In orthopedic trauma patients, homelessness was associated with <i>more emergency department visits</i> and <i>fewer clinic follow up</i> visits after surgery. Homeless patients were <i>more likely to receive non-operative treatment</i> than housed patients.
	Kiwanuka et. al. 2019	Among burn patients, those who were homeless had <i>longer lengths of stay</i> and were <i>less likely to receive surgical intervention</i> compared to housed patients.
	Manzano-Nunez et. al. 2019	Homeless patients in <i>Medicaid expansion states</i> had lower odds of leaving against medical advice, were more likely <i>receive home healthcare</i> , and had <i>lower total index hospital charges</i> compared to those in non-Medicaid expansion states.
	Wadhera et. al. 2020	Homeless individuals hospitalized with acute myocardial infarction were <i>significantly less likely to undergo coronary angiography, PCI<sup>1</sup>, and CABG<sup>2</sup></i> compared to non-homeless adults and had <i>higher mortality rates</i> .

<sup>1</sup>PCI = percutaneous coronary intervention

<sup>2</sup>CABG = coronary artery bypass grafting



eTable 1: Search Strings

**PubMed**

#1	<b>"Homeless Persons"[Mesh] OR homeless*[tw]</b>
#2	"Perioperative Period"[Mesh] OR "Perioperative Care"[Mesh] OR "Perioperative Medicine"[Mesh] OR "Perioperative Nursing"[Mesh] OR "Surgical Procedures, Operative"[Mesh] OR "Postoperative Complications"[Mesh] OR surg*[tw] OR operative[tw] OR "surgery" [Subheading] OR "invasive procedure*" [tw] OR operations[tw] OR perioperative[tw] OR "peri operative" [tw] OR intraoperative[tw] OR "intra operative" [tw] OR peroperative[tw] OR "per operative" [tw] OR preoperative[tw] OR "pre operative" [tw] OR postoperative[tw] OR "post operative" [tw]
#3	<b>#1 AND #2</b>

**Embase**

#1	<b>('homeless person'/exp) OR (homeless* OR "street people"):ti,ab</b>
#2	('surgery'/exp) OR ('postoperative complication'/exp) OR ('preoperative complication'/exp) OR ('operative complication'/exp) OR ('perioperative nursing'/exp) OR (surg* OR operative OR "invasive procedure*" OR operations OR perioperative OR "peri operative" OR intraoperative OR "intra operative" OR peroperative OR "per operative" OR preoperative OR "pre operative" OR postoperative OR "post operative"):ti,ab
#3	<b>#1 AND #2</b>
#4	([conference abstract]/lim OR [conference paper]/lim OR [conference review]/lim OR [editorial]/lim OR [erratum]/lim OR [letter]/lim OR [note]/lim OR [short survey]/lim)
#5	<b>#3 NOT #4</b>

**Web of Science. Limited to journal articles.**

#1	<b>TS=(homeless* OR "street people")</b>
#2	TS=(surg* OR operative OR "invasive procedure*" OR operations OR perioperative OR "peri operative" OR intraoperative OR "intra operative" OR peroperative OR "per operative" OR preoperative OR "pre operative" OR postoperative OR "post operative")
#3	<b>#1 AND #2</b>

**Cochrane**

#1	<b>[mh "Homeless Persons"] OR homeless* OR "street people"</b>
#2	[mh "Perioperative Period"] OR [mh "Perioperative Care"] OR [mh "Perioperative Medicine"] OR [mh "Perioperative Nursing"] OR [mh "Surgical Procedures, Operative"] OR [mh "Postoperative Complications"] OR surg* OR operative OR "invasive procedure*" OR operations OR perioperative OR "peri operative" OR intraoperative OR "intra operative" OR peroperative OR "per operative" OR preoperative OR "pre operative" OR postoperative OR "post operative"
#3	<b>#1 AND #2</b>

