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Research Article

Surgical risks and care trends: A cross sectional study of people experiencing homelessness presenting at a free clinic care in Miami-Dade County

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ABSTRACT

Background: The effects of housing insecurity on surgical care are under researched and largely unknown. Thus far, studies on surgery outcomes of people experiencing homelessness either focus on shelter-based patients or do not differentiate whether patients are sheltered or unsheltered, despite significant differences in care needs and health risks. Herein we provide the first report on surgical care trends of people experiencing unsheltered homelessness.

Methods: Clinical history, medication list, and blood pressure records of 300 people experiencing unsheltered homelessness receiving care at a free mobile clinic were deidentified, downloaded and analyzed in R studio 4.3.0. Participants were asked whether they had undergone surgery and included surgical history for those who had.

Results: Of 300 participants, 18 % ($N = 55$) had a history of surgery, most common being 1) orthopedics ($N = 20$), 2) vascular ($N = 18$), 3) general ($N = 6$), 4) acute trauma response ($N = 5$), 5) ophthalmology ($N = 4$), 6) surgical oncology ($N = 2$). Post-discharge, 13 % returned with wound site infections and 9 % were readmitted for treatment. Chi Square test showed Hypertension [X2 (1, $n = 300$)=10.9, $p < 0.001$] and Type II Diabetes [X2 (1, $n = 300$)=10.5, $p = 0.0012$] significantly increased likelihood of needing vascular surgery, particularly lower extremity wound debridement or amputation.

Conclusion: Little research has been done assessing surgical care trends for people experiencing unsheltered homelessness. Results indicate possible presence of barriers accessing cancer care and increased risk for vascular disease needing surgical intervention. Future research is needed to understand, address, and overcome current surgical care barriers to help this at-risk and underserved community.

Introduction

People Experiencing Homelessness (PEH) are a vulnerable population with marked disparities in health outcomes and reduced access to healthcare [1–3]. The high rates of morbidity and mortality [2,3] faced by PEH compared to the general population implores medical and public health researchers to assess trends in PEH use of healthcare services to better understand care gaps and post- engagement with care outcomes. Research has found PEH engage with different aspects of the healthcare system in distinct ways. For example, reports show PEH have low engagement rates with primary care services, [4–6] and high engagement rates with emergency department (ED) services [7–10], when compared to the general population. Such findings demonstrate that existing barriers to PEH accessing medical care are not uniform across health systems and specialties.

While engagement trends, and post- service engagement health outcomes, are well described for some medical specialties and clinical services, research reporting surgery trends and post-surgical outcomes of PEH is scant. The dearth in PEH surgical service engagement literature means little is known on topics of clinical concern, such as most

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common procedures, pre- and post-discharge outcomes, infection rates and hospital readmission rates [11]. Studies which do investigate PEH surgery trends are based primarily on shelter-based PEH (PESH); even rarer are studies focusing on People Experiencing *Unsheltered* Homelessness (PEUH) [11].

PEUH represent around 30 % of the total PEH population in the United States [12]. Studies show PEUH have unique disease trends and care needs compared to PESH [13–16]. A survey of 100,000 PEH found PEUH identify more often as male and are younger on average than PESH. When the survey compared PEUH and PESH clinical trends, PEUH were found to experience increased rates of substance use disorder and severe psychiatric comorbidities, and PEUH identifying as female and transgender were at significantly increased risk of premature mortality [16]. Health services studies indicate PEUH and PESH also have notable differences in engagement trends. Studies on rate of primary care service use among PEH show 25 % of PESH vs. <10 % of PEUH routinely engage with primary care services [13,16–18]. Treglia et al. found PESH visit the ED more frequently and have increased rates of hospital admission compared to PEUH. It is currently unknown if these differences between PESH and PEUH engagement trends extend to surgical care services.

Our aim is to begin to fill the existing data gap in PEUH engagement with surgical health services by reporting surgery types and trends in a cohort of PEUH presenting at a free medical clinic in Miami-Dade County. Herein we will report: 1) cohort characteristics, most common indications for surgery, rates of surgical care, and most common types of surgery, 2) describe PEUH experiences of post-surgery discharge and follow-up care, including reports of surgical wound infections, pain management, and hospital readmission rate, and 3) conduct relative risk analysis to assess impact of two common chronic diseases, Type II Diabetes and Hypertension, on PEUH surgery trends and post- surgical health outcomes.

Methods

Research protocols for participant recruitment and informed consent were completed in compliance with regulations outlined by the University of Miami as well as the Florida Department of Health and was approved by the Human Services Office of Human Research Protections.

Research Setting: Patient clinical history, surgical history, current medications, as well as demographic information were documented during clinical street outreach encounters conducted by Miami Street Medicine, a 501c3 nonprofit registered with the Florida Department of Health. Funding for equipment and medications are charity-based and nonprofit grant sourced. The encounters took place between January 2021 and May 2023. Patients were approached at their rough sleeper quarters - in tents, sleeping bags, or blankets located on sidewalks, in encampments, or areas under overpasses. Patients were asked if they would like to receive medical care. If they said yes, the patient was then evaluated on the street, and a patient navigation coordinator could arrange additional outpatient or inpatient follow up care if needed. The weekly outreach schedule was spread by word of mouth. The geographic scope was limited to a one-mile radius around Jackson Memorial Hospital, an area known as the Miami Medical District.

Participant Recruitment: Patients who consented to medical management by Miami Street Medicine physicians and staff had the option to separately consent to have the results made available for research purposes. Miami Street Medicine have staff who can conduct clinical histories on site in English, Spanish, and Haitian Creole, and have a dial-in translation service for patients with any other primary language preferences. To be included in this study, participants had to self-report experiencing unsheltered homelessness at the time of consent. If eligible, patients were then educated on the reasons for their clinical data, and study methods taken to uphold patient anonymity were thoroughly explained. In addition, patients were informed that should they refuse, their refusal to research participation did not preclude them from receiving medical care.

Data collection

Patient History: During the patient encounter, clinic staff documented the patient's list of present illnesses, including new symptoms, recent diagnosis, and chronic diseases. Participant demographics factors such as age, gender, race and ethnicity were documented as well. During the clinical encounter, patients are asked to present any prescription medication bottles they had brought with them to staff to assess medication type and adherence to recommended treatment.

When taking patient histories, clinic staff asked included study participants whether they had ever undergone a surgical procedure. If the participant reported that they had previously undergone a surgery, they were then asked follow-up questions. Participants were asked to provide information on the type of procedure, the clinical indication, how long it had been since their procedure, and whether the procedure was scheduled or had been part of an emergency. Participants were also asked to describe their experiences with follow-up care post-surgical discharge. Miami Street Medicine volunteers and staff involved with patient care had access to the participant chart in a HIPAA compliant Research Electronic Data Capture (REDCap) record system. After each clinical encounter clinic staff would transfer study relevant information to the REDCap, and then safely dispose of any written material. Participant information was de-identified before being downloaded and sent to researchers in an Excel data spreadsheet for analysis.

Blood Pressure Readings: Blood pressure measurements followed the standard American Heart Association protocol guidelines and used an Omron HEM 907XL blood pressure monitor. Patients sat on a portable stool with their arm relaxed at the level of their heart. The pressure cuff was placed on either the left or right upper arm while the patient's feet were firmly on the floor. Results were entered into a REDCap database and were similarly de-identified before being downloaded and sent to researchers for analysis. Study criteria for elevated blood pressure followed the American College of Cardiology definition: systolic blood pressure >130 mmHg and diastolic blood pressure >80 mmHg [19].

Statistical Analysis: Statistical analysis was performed using R studio version 4.3.0.

Results

De-identified data from 300 patients treated by Miami Street Medicine are presented. Of the 300 included participants, 55 PEUH reported previously undergoing a surgical procedure.

1) Cohort demographics, surgical types and trends

Demographic details of participants and relative rates of surgical care can be found in Appendix Table 1. Average ages were compared with unpaired two tailed t-test. Demographic groups with less than 4 participants were not included. When comparing the 245 participants without a surgical history to the 55 who had undergone a previous surgical procedure, no significant differences in participant demographics were identified.

A visual representation for the most common surgery types can be seen in Fig. 1.

The most common area of surgical focus was orthopedics. The most common orthopedic procedures were total knee arthroscopy ($N = 5$), followed by foot surgeries, including open reduction and internal fixation for toe or ankle fractures and calcaneal stress fracture ($N = 4$), followed by shoulder surgeries ($N = 2$). Vascular procedures were the second most common and were mostly debridement procedures ($N = 11$) and limb amputations ($N = 5$) to treat lower extremity wound infections. General surgeries were third and the most common procedures were hernia repairs ($N = 5$). Acute trauma response consisted of surgical exploration procedures to treat gunshot wounds to the face and abdomen as well as one for stabilization post motor vehicle accident. Surgical ophthalmology care was for cataract procedures and one to treat an orbital wound infection. Both oncology procedures were melanoma removals.

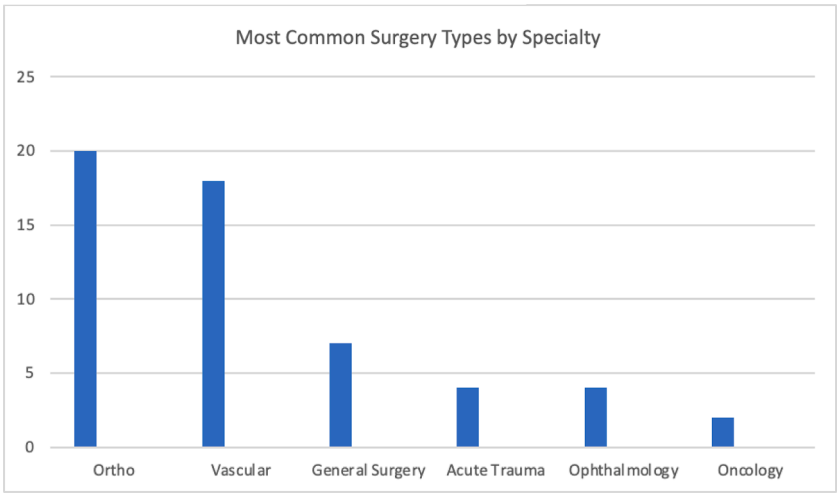

Fig. 1. Most Common Surgery Types by Specialty.

When participants were asked about the clinical indication for their surgery, 47 of 55 participants stated the reason to be lower extremity pain or open wound. Of the 245 participants who did not have a surgical history, 20.4 % indicated having lower extremity pain or numbness and chronic lower extremity wounds when they were asked to list their presenting illnesses.

2) Post- surgery in-hospital stay, discharge follow-up and care

The most common post-surgical length of stay reported was 4 days ($N = 8$). Average length of stay was not included in the report as results were substantially affected by an outlier from one participant who was admitted to the hospital for over 9 months. When participants were asked whether they were readmitted to the hospital within 30 days after being discharged post-surgery, 20 % ($N = 11$) of participants stated they returned to the ED at least one time within 30 days of post-surgery discharge. The most common reason participants went to the ED was surgical site infection ($N = 7$). At the time of ED presentation, two infection cases had already progressed to cellulitis and one to osteomyelitis. Of the seven participants who returned to the ED, five needed to be admitted for inpatient hospital treatment. Therefore, of the PEUH who had previously undergone a surgical procedure, 9 % reported having surgical wound site infections requiring intravenous antibiotics.

When asked for feedback on their surgical experience and how it could have been improved, participants routinely spoke about feeling high levels of pain and going long periods of time without adequate pain management, both while in the hospital and after discharge. Post-discharge, 13.0 % of participants reported being prescribed opioids. The rest of the PEUH participants, including participants who received orthopedic surgeries and amputations, reported being prescribed non-opioid analgesics for pain management post procedure.

3) Impact of chronic diseases on PEUH surgery outcomes

Hypertension was the most common chronic illness reported for all participants, regardless of surgical history. Of the 55 participants who had undergone a surgical procedure, 57 % reported clinical history significant for hypertension. Among participants who had not undergone surgery, 15.9 % self-reported a clinical history significant for hypertension. Participants with a history of hypertension were at increased risk of requiring surgical care RR 2.12, 95 % CI 1.36–3.31, $p = 0.0009$. Chi square test showed having a clinical diagnosis of hypertension made participants significantly more likely to have undergone vascular surgery, particularly for lower extremity open wound debridement or amputation X^2 (1, $n = 300$) = 10.9, $p = 0.000985$.

During the physical exam, blood pressures were taken, and no differences was found between the surgical history vs. no surgical history group rates of elevated blood pressure. The clinical encounter blood pressure assessments found 71 % of participants with a surgical history to have elevated blood pressure, and 57 % of participants without a surgical history to have elevated blood pressure. The participants with a history of surgery were not found to be at increased risk for having elevated blood pressure during the clinical encounter RR 0.79, 95 % CI 0.62–1.01, $p = 0.0654$. Not every participant had more than one clinical encounter, and without a second blood pressure reading taken between 1 and 4 weeks after the first, we cannot confirm the elevated blood pressures found are indicative of the true clinical hypertension prevalence rate by American College of Cardiology and American Heart Association diagnostic criteria standards.

Participants with a previous surgical history were significantly more likely to report being prescribed hypertension medication in the past. Participant adherence to blood pressure medication use was low. In both surgery and non-surgery groups, only around 35 % of those previously prescribed blood pressure medication reported routinely taking it. The most common hypertension medications used in both groups were ACE inhibitors, ARBs and beta blockers. The single most common blood pressure medication reported was lisinopril, representing over 30 % of all medications taken by participants.

The second most common disease reported by participants, both with and without a surgical history, was Type II Diabetes. Of the 245 participants without a surgical history, 11.1 % reported being diagnosed with Type II Diabetes vs. 32.7 % of participants with a surgical history. Participants with a surgical history were at increased risk of having a Type II Diabetes diagnosis RR 2.97, 95 % CI 1.77–4.99, $p < 0.0001$. Further analysis with a chi square test showed participants with Type II Diabetes were also more likely to have had vascular surgery, particularly for lower extremity open wound amputation or debridement X^2 (1, $n = 300$) = 10.5, $p = 0.001201$. Almost all participants who reported having Type II Diabetes, regardless of surgical history, stated they had previously been prescribed medication. Adherence to blood sugar control medication was higher than blood pressure control medication. Around 55 % in both the surgical history and no surgical history group reported routinely taking their blood sugar medication. Metformin was the most common medication prescribed, representing over 40 % of total Diabetes medications, followed by insulin and sulfonylureas. Miami Street Medicine only provides Hemoglobin A1c readings by patient request, and only 5 participants out of the total 300 PEUH cohort requested to have their A1c measured at clinic.

Discussion

Our study of 300 participant clinical histories yielded significant insights on trends of PEUH and surgical health services engagement. Our study found 18 % of PEUH participants had a previous history of

undergoing surgery. Results indicate two notable areas of dispersion from average rates of surgical care engagement: first, the *reduced* rates of oncology procedures compared to the general population, and second, the *increased* rate of vascular surgeries, such as limb amputations and wound debridement procedures.

Only 2 participants received surgery as part of oncology treatment, and both were melanoma removal procedures. There were no surgical oncology cases for colon, breast, lung, and other types of cancers common in the population and routinely treated with surgical care. To be clear, we do not believe that lower rates of surgical oncology indicate overall lower rates of cancer. To the contrary, national data shows PEH have increased rates of multiple types of cancers and numerous studies have shown PEUH have high rates of cancer risk increasing behaviors such as smoking [20,21]. Reduced surgical cancer treatment rates are more likely to reflect reduced rates of early disease diagnosis, as existing barriers to primary care for PEUH [4–6] means they are unlikely to benefit from routine cancer screenings.

Inaccessibility of primary care may be a key component, in addition to surgical oncology findings, to trends in vascular surgery engagement found in the cohort. In addition to reduced rates of routine cancer screening, PEUH in our study do not benefit from any outpatient proactive care for health promotion and illnesses prevention. Instead, they rely on interventive care for acute symptom management of established diseases [13,18–21] Our study found Hypertension and Type II Diabetes to be significantly associated with participants requiring surgical care, particularly vascular surgery. Hypertension and Type II Diabetes are two diseases routinely managed in outpatient primary care settings [22]. Lack of outpatient prevention care monitoring and managing these chronic diseases likely impact the rate of interventive care necessary to treat toxic sequela of untreated disease, such as amputations and wound debridement treatments. National data indicates 4 % of patients with Peripheral Artery Disease will end up undergoing amputation [23]. Results of our cohort study lead us to believe the rates are likely much higher in PEUH.

While our findings offer insight on the impact of lack of primary care on surgical care trends for PEUH. At the same time, lack of routine primary care use by participants produces several important study limitations. Notably, interpreting the data it is unclear whether the increased rate of Hypertension and Type II Diabetes found in cohort participants who had previously received surgical care indicates participants with these conditions were at increased risk for needing surgical intervention or the surgery offered an opportunity for PEUH to be seen by a health professional to provide a diagnosis. Equal rates of elevated blood pressure during the one-time measurements taken at clinical encounters provide additional evidence indicating the later to be the case, however even these readings must be questioned as they were only taken one-time and as such are not an accurate reflection of clinical hypertension prevalence.

The greatest limitation to our study is also its greatest strength, which is that to our knowledge it is the first to report trends of PEUH engagement with surgical care. We are presenting trends, risks, and outcomes which were previously completely unknown in this population. While doing so contributes substantial insight on an under researched and vulnerable population, the paucity of data makes it impossible to assess validity of results by comparison with other published literature in the field. A review of literature for studies on PEH and vascular surgery yielded two studies: one by Levin et al. [24] and one by Titan et al. [25]. The Levin et al. study was not aimed at investigating care trends for PEH, but rather included data from a registry on which 0.2 % of included entrees indicated the individual had a current or previous history of unstable housing [24]. Titan et al. conducted a study of PEH who recently underwent general, vascular, or orthopedic surgery, grouping all three types together when reporting results [25]. We consulted a Systematic Literature Review published in 2022 by Abel et al. which confirmed these to be the only published studies on PEH and vascular surgery. The review did not find any surgery studies that reported findings specifically on PEUH [11].

Current shortages of PEUH outcomes present in surgical literature could be partially attributed to common methods of participant recruitment and data collection limiting the ability for post-study analysis of outcomes specific to PEUH. To collect PEH data, studies will commonly use the following two methods: 1) recruit participants from a shelter [6,26], or 2) collect de-identified datasets with relevant codes from International Classification of Disease (ICD) 10th Edition listed in patient charts. Surgeries are commonly performed in hospital settings; as such, the second data collection method is often used in studies assessing surgical care trends of PEH [25,27–33]. Previously ICD-10 did not have codes to differentiate sheltered vs. unsheltered homelessness [34]. As such, results from these studies could not report outcomes specific to PEUH or shelter based PEH. For example, the Titan et al. study analyzed a hospital dataset containing patients with the ICD-10 code for housing instability to assess PEH outcomes post-discharge from general, vascular, and orthopedic surgery. The study found patients with the ICD-10 code for housing instability were at increased risk for 30-day hospital readmission compared to participants without the ICD-10 code in their charts [25]. It is unknown whether these findings would still be valid were data on PEUH analyzed separately. With the addition of ICD-10 z codes, differentiation is possible: Z59.01 is sheltered homelessness and Z59.02 is unsheltered homelessness. Widescale use of z codes would generate large datasets trending the surgical outcomes of PESH and PEUH that could be used to assess their similarities and differences. Unfortunately, use of z codes in patient charts remains fairly uncommon. To increase the quality and quantity of data on PEUH surgical outcomes, researchers should advocate for the use of z codes at their clinical sites to standardize the documentation of housing status in patient charts. Doing so will allow for independent assessment of PEUH and PESH, as combining the two limits generalizability of results. When studies report specifically on outcomes of PEUH or PESH, the results will have increased accuracy and validity and will better inform clinical care strategies.

Understanding the nuanced risks and needs of each group will also enable more targeted patient outreach, reduce barriers to important health services, and improve outcomes for PESH and PEUH patients who undergo surgical care. Increasing the amount of PEUH surgical data available will inform which areas to assess further with longitudinal study design, as well as identify outcomes of interest. Longitudinal studies in turn inform the development of interventions and pilot programs; importantly, they can also be used to advocate for the implementation of coordinated care models [35]. Indeed, an integrated care model may benefit PEUH and improve their post-surgical outcomes, however without published data the potential for positive impact remains unknown. On a broader scale, national data will document how different geographic areas may vary in PEUH surgical care access and subsequent outcomes, highlighting regional differences that could be used to inform changes in public health and healthcare policies.

The goal of this study was to add to the data available on PEUH surgical outcomes; however, surprisingly, there were no other surgical outcomes published on PEUH, and thus no context to base our results, guide the focus of longitudinal studies, develop pilot programs, evaluate clinical care models, and justify healthcare policy implementation. A key takeaway point from this study is that there are no findings which means there are no evidence-informed quality improvement efforts and interventions helping this high-risk population when undergoing surgical procedures. It is our hope that these results spur new research to ensure efforts to improve surgical outcomes for PEUH are rooted in evidence-based science so that PEUH receive care that is both considerate in approach and clinically effective.

CRediT authorship contribution statement

Shivangi Parmar: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Software,

Validation, Writing – original draft, Writing – review & editing. **Emily Eachus:** Conceptualization, Investigation, Project administration, Writing – review & editing. **Orly Morgan:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Validation, Writing – original draft, Writing – review & editing. **Boris Yang:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology. **Violet Victoria:** Conceptualization, Data curation, Formal analysis, Investigation, Writing – original draft. **Suhas Seshadri:** Conceptualization, Data curation, Formal analysis, Investigation, Software, Writing – original draft. **Armen Henderson:** Data curation, Project administration, Software, Supervision, Writing – review & editing. **Stefan Kenel-Pierre:** Supervision, Writing – review & editing. **Joshua Laban:** Conceptualization, Investigation, Project administration, Resources, Supervision, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Ethical approval

All procedures and data collection performed in studies involving human participants were in accordance with the ethical standards of the institution and approved by the University of
Miami Miller School of Medicine Internal Review Board.

Informed consent

Informed consent was obtained from all individual participants included in the study.

Data availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Appendix

Table A1
Characteristics of study participants.

Characteristic	No Surgery $N = 245$ (81 %)	Surgery $N = 55$ (18 %)	Relative Risk	Significance, P	Confidence Intervals
Age, Mean (SD)	53.6 (13.3)	55.2 (9.3)	–	0.3980	−5.3–2.1
Age, No. (%)	12 (5 %)	–	0.93	–	–
20–29	24 (10 %)	5 (9 %)	0.72	0.8733	0.4–2.3
30–39	37 (15 %)	6 (11 %)	1.17	0.4322	0.3–1.6
40–49	76 (31 %)	20(36 %)	1.15	0.4319	0.8–1.7
50–59	70 (29 %)	18 (33 %)	0.93	0.5336	0.3–1.0
60–69	26 (11 %)	5 (9 %)		0.8980	0.7–1.6
70+					
Gender, No. (%)	164 (67 %)	38 (69 %)	1.00	0.9687	0.8–1.2
Male	81 (33 %)	19 (31 %)	1.00	0.9686	0.7–1.5
Female					
Race and Ethnicity,	92 (25 %)	21 (50 %)	1.22	0.2922	0.8–1.8
No. (%)	91 (42 %)	20 (32 %)	1.22	0.4073	0.8–1.7
Hispanic / Latinx	54 (32 %)	12 (12 %)	1.03	0.9158	0.6–1.8
Non-Hispanic African American	10 (2 %)	–	–	–	–
Non-Hispanic White					
Other					
Language of Interview,	166 (68 %)	37 (67 %)	1.03	0.7706	0.8–1.3
No. (%)	65 (27 %)	16 (29 %)	0.59	0.7636	0.6–1.5
English	14 (6 %)	–	–	–	–
Spanish					
Other					

References

[1] Baggett TP, O'Connell JJ, Singer DE, Rigotti NA. The unmet health care needs of homeless adults: a national study. Am J Public Health 2010;100(7):1326–33. https://doi.org/10.2105/ajph.2009.180109.

[2] Morrison David S. Homelessness as an independent risk factor for mortality: results from a retrospective cohort study. Int J Epidemiol June 2009;38(3):877–83. https://doi.org/10.1093/ije/dyp160.

[3] Ngo AN, Turbow DJ. Principal Component analysis of Morbidity and Mortality among the United States Homeless Population A systematic Review and Meta-Analysis. Inter Arch Public Health. Community Med 2019;3:025. https://doi.org/10.23937/2643-4512/1710025.

[4] Schanzer B, Dominguez B, Shrout PE, Caton CL. Homelessness, health status, and health care use. Am J Public Health Mar 2007;97(3):464–9. https://doi.org/10.2105/AJPH.2005.076190. Epub 2007 Jan 31. PMID: 17267724; PMCID: PMC1805022.

[5] Martin P, Liaw W, Bazemore A, Jetty A, Petterson S, Kushel M. Adults with housing insecurity have worse access to primary and preventive care. Journal of the American Board of Family Medicine 2019;32(4):521–30. https://doi.org/10.3122/jabfm.2019.04.180374.

[6] Khandor E, Mason K, Chambers C, Rossiter K, Cowan L, Hwang SW. Access to primary health care among homeless adults in Toronto, Canada: results from the Street Health survey. Open Med 2011;5(2):e94–103. Epub 2011 May 24. PMID: 21915240; PMCID: PMC3148004.

[7] Vohra N, Paudyal V, Price MJ. Homelessness and the use of Emergency Department as a source of healthcare: a systematic review. Int J Emerg Med 2022;15:32. https://doi.org/10.1186/s12245-022-00435-3.

[8] Chambers C, Chiu S, Katic M, et al. High utilizers of emergency health services in a population-based cohort of homeless adults. Am J Public Health 2013;103(suppl 2):S302–10.

[9] Ku BS, Scott KC, Kertesz SG, Pitts SR. Factors associated with use of urban emergency departments by the US homeless population. Public Health Rep 2010; 125(3):398–405.

[10] Fazel S, Geddes JR, Kushel M. The health of homeless people in high-income countries: descriptive epidemiology, health consequences, and clinical and policy recommendations. Lancet 2014;384:1529–40.

[11] Abel MK, Schwartz H, Lin JA, Decker HC, Wu CL, Grant MC, Kushel M, Wick EC. Surgical Care of Patients Experiencing Homelessness: a Scoping Review Using a Phases of Care Conceptual Framework. J Am Coll Surg Aug 2022;235(2):350–60. https://doi.org/10.1097/XCS.0000000000000214. Epub 2022 Apr 5. PMID: 35839414; PMCID: PMC9668043.

[12] The 2022 Annual Homelessness Assessment Report to Congress. The United States Department of Housing and Urban Development. https://www.huduser.gov/portal/sites/default/files/pdf/2022-AHAR-Part-1.pdf.

[13] Stefanowicz Michael, et al. House Calls Without Walls: street Medicine Delivers Primary Care to Unsheltered Persons Experiencing Homelessness. Ann Fam Med Jan. Feb. 2021;19(1):84. *Gale OneFile: Health and Medicine*.

[14] Seshadri Suhas, Morgan Orly, Rasul Taha, Bergholz Daniel, Henderson Armen. Abstract 087: analysis Of Blood Pressure Readings Among The Unsheltered Population Of Miami-Dade County. Hypertension 2022;79. https://doi.org/10.1161/hyp.79.suppl_1.087.

[15] Petrovich JC, Hunt JJ, North CS, Pollio DE, Roark Murphy E. Comparing unsheltered and sheltered homeless: demographics, health services use and predictors of health services use. Community Ment health J 2019;56:271–9.

[16] Stergiopoulos V, Dewa CS, Tanner G, Chau N, Pett M, Connelly JL. Addressing the needs of the street homeless: a collaborative approach. Int J Ment Health 2010;39: 3–15.

[17] Ra CK, Hébert ET, Alexander A, Kendzor DE, Suchting R, Businelle MS. Unsheltered homeless and unstably housed adults have higher levels of stress and more health risk factors than sheltered homeless adults. Journal of Social Distress and Homelessness; 2021. p. 1–9.

[18] Rountree J., Hess N. and Lyke A. Health conditions among unsheltered adults in the US. 2019.

[19] Whelton PK, Carey RM, Mancia G, Kreutz R, Bundy JD, Williams B. Harmonization of the American College of Cardiology/American Heart Association and European Society of Cardiology/European Society of Hypertension Blood Pressure/ Hypertension Guidelines: comparisons, Reflections, and Recommendations. Circulation 2022;146:868–77.

[20] Baggett TP, Lebrun-Harris LA, Rigotti NA. Homelessness, cigarette smoking and desire to quit: results from a US national study. Addiction Nov 2013;108(11): 2009–18. https://doi.org/10.1111/add.12292. Epub 2013 Aug 14. PMID: 23834157; PMCID: PMC3797258.

[21] Soar K, Dawkins L, Robson D, Cox S. Smoking amongst adults experiencing homelessness: a systematic review of prevalence rates, interventions and the barriers and facilitators to quitting and staying quit. J Smok Cessat 2020;15(2): 94–108. https://doi.org/10.1017/jsc.2020.11.

[22] United States Preventive Services Task Force. The guide to clinical preventive services 2014: recommendations of the US preventive services taskforce. Report no.: 14–05158. Rockville: Agency for healthcare research and quality; 2014.

[23] Aday AW, Matsushita K. Epidemiology of Peripheral Artery Disease and Polyvascular Disease. Circ Res Jun 2021;128(12):1818–32. https://doi.org/10.1161/CIRCRESAHA.121.318535. Epub 2021 Jun 10. PMID: 34110907; PMCID: PMC8202714.

[24] Levin SR, Farber A, Arinze N, et al. Intravenous drug use history is not associated with poorer outcomes after arteriovenous access creation. J Vasc Surg 2021;73(1): 291–300. https://doi.org/10.1016/j.jvs.2020.04.521. e7.

[25] Titan A, Graham L, Rosen A, et al. Homeless Status, Postdischarge Health Care Utilization, and Readmission after Surgery. Med Care 2018;56(6):460–9. https://doi.org/10.1097/MLR.0000000000000915.

[26] Asgary R, Sckell B, Alcabes A, Naderi R, Schoenthaler A, Ogedegbe G. Rates and Predictors of Uncontrolled Hypertension Among Hypertensive Homeless Adults Using New York City Shelter-Based Clinics. Ann Fam Med Jan-Feb 2016;14(1): 41–6. https://doi.org/10.1370/afm.1882. PMID: 26755782; PMCID: PMC4709154.

[27] Rollings KA, Kunnath N, Ryus CR, Janke AT, Ibrahim AM. Association of Coded Housing Instability and Hospitalization in the US. JAMA Netw Open 2022;5(11): e2241951. https://doi.org/10.1001/jamanetworkopen.2022.41951 (2020).Adams J, Rosenheck R, Gee L, Seibyl CL, Kushel M. Hospitalized younger: A comparison of a national sample of homeless and housed inpatient veterans. *Journal of Health Care for the Poor and Underserved* 2007;18(1):173–184. 10.1353/hpu.2007.0000.

[28] Trick WE, Rachman F, Hinami K, Hill JC, Conover C, Diep L, Gordon HS, Kho A, Meltzer DO, Shah RC, Stellon E, Thangaraj P, Toepfer PS. Variability in comorbidites and health services use across homeless typologies: multicenter data linkage between healthcare and homeless systems. BMC Public Health May 2021; 21(1):917. https://doi.org/10.1186/s12889-021-10958-8. PMID: 33985452; PMCID: PMC8117275.

[29] Committee on the recommended social and behavioral domains and measures for electronic health records; board on population health and public health practice; institute of medicine. *capturing social and behavioral domains and measures in electronic health records: phase 2*. Washington, DC: The National Academies Press; 2014.

[30] Friedman NL, Banegas MP. Toward Addressing Social Determinants of Health: a Health Care System Strategy. Perm J Oct 2018;22:18–095. https://doi.org/10.7812/TPP/18-095. PMCID: PMC6207437.

[31] Nguyen Audrey B, Grimes Barbara, Neuhaus John, Pomerantz Jason H. A Cross-sectional Study of the Association between Homelessness and Facial Fractures. Plastic and Reconstructive Surgery - Global Open June 2019;7(6):e2254. https://doi.org/10.1097/GOX.0000000000002254.

[32] Kushel M. Homelessness: a Potent Risk Factor for Readmission. Med Care Jun 2018;56(6):457–9. https://doi.org/10.1097/MLR.0000000000000920. PMID: 29746347.

[33] Homelessness Kushel M. A potent risk factor for readmission. Med Care 2018;56 (6):457–9. https://doi.org/10.1097/MLR.0000000000000920.

[34] The 2023 edition of ICD-10-CM Z59. https://www.icd10data.com/ICD10CM/Codes/Z00-Z99/Z55-Z65/Z59-/Z59.0.

[35] De Regge M, De Pourcq K, Meijboom B, et al. The role of hospitals in bridging the care continuum: a systematic review of coordination of care and follow-up for adults with chronic conditions. BMC Health Serv Res 2017;17:550. https://doi.org/10.1186/s12913-017-2500-0.