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Comparison of Housed and Homeless Patients with an Orthopedic Diagnosis

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A thesis submitted in partial fulfillment of the requirements for the Master of Science degree in Nursing

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COMPARISON OF HOUSED AND HOMELESS PATIENTS WITH AN ORTHOPEDIC
DIAGNOSIS

(Thesis format: Integrated Article)

by

Susan Williams RN, BScN

Graduate Program in Nursing

A thesis submitted in partial fulfillment
of the requirements for the degree of
Masters of Science in Nursing

The School of Graduate and Postdoctoral Studies
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London, Ontario, Canada

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Abstract

Studies on homelessness have shown that people who are homeless are admitted to hospital more frequently, for longer periods of time, and at a younger age than people who are housed. Once admitted to hospital, discharge planning is difficult and resource intensive, often leading to discharge back to the streets or to a shelter. This puts this population at risk for complications and readmission. Although people who are homeless are prone to orthopedic injuries, there is no research on the outcomes of patients who are homeless with orthopedic injuries. This retrospective, case control study looks at the effect of housing status on the length of stay, and, the outcomes of infection and attendance at follow up in the orthopedic population of a mid-sized academic tertiary care hospital in Southwestern Ontario. The records of thirty-three matched pairs of housed and homeless orthopedic patients were examined. Findings showed that homeless patients have longer lengths of stay, are less likely to attend clinic follow up appointments, are more likely to return to the emergency department, and have higher rates of readmission for infections. The results of this study show that interventions are needed to improve the health outcomes of people who are homeless and reduce the associated costs to the health care system.

Key Words: homelessness, orthopedic outcomes, length of stay, infection, follow up, social determinants of health, discharge, respite care,

Dedication

I dedicate this thesis to my husband Mike and my children, Morgan, Brian and Shannon whose love and sacrifices are a part of this work.

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Chapter One

Introduction

Homelessness is the culmination of a series of failures in our social systems (Forchuk, Schofield, Joplin, Csiernik, Gorlick, & Turner, 2011; Gaetz, Donaldson, Richter, & Gulliver, 2013). Once homeless, individuals continue to experience many disadvantages which have negative effects on both their physical and psychological health. This study compares the outcomes for people who have an orthopedic admission to an acute care facility and are housed with people who are admitted with similar diagnosis but are homeless.

This chapter will provide a background on homelessness and outline the significance of this study. It will provide a literature review of the effects of homelessness on health and on homelessness and health care. The social determinants of health will be introduced as the theoretical basis of this research. The chapter will conclude with the purpose of this research.

Background and Significance

People who are homeless are one of the most disadvantaged and marginalized groups in society. Homelessness is created by the interaction of structural factors such as poverty and lack of affordable housing; systems failure such as discharges from hospitals, mental institutions or correctional facilities to homelessness; and individual circumstances such as family conflict, mental illness or addiction (Frankish, Hwang, & Quantz, 2005; Gaetz et al., 2013). The number of homeless individuals and families in Canada as the result of changes in social programs and political policies which have led to a decrease in social, financial and housing supports (Bryant, 2004; Forchuk et al.,

2011; Gaetz et al., 2013). Since the 1990's minimum wage, Employment Insurance, and social assistance have not only failed to keep up with inflation but have actually decreased in relation to inflation, and fewer people are eligible. This situation leaves more people without adequate income to support increased housing costs (Gaetz et al., 2013; Stapleton, 2004). Federal and Provincial housing policies over the last two decades have led to a dramatic decrease in affordable rental housing and in socially assisted housing so that the supply of such units is not keeping pace with the demands (Bryant, 2004; Forchuk et al., 2011; Gaetz et al., 2013).

The homeless population is a divergent group with complex needs requiring cooperation and partnerships among social and health programs in order to assist them (Berman et al., 2011; Sebastian, 1985). Once thought of consisting solely of middle-aged, single men, there has been a rapid increase in families among the homeless (Hulchanski & Shapcott, 2004). Segart (2012) found that the number of children and older adults who are homeless are also rising. For the majority, homelessness is transient or episodic but for others it is a chronic condition (Frankish et al., 2005; Gaetz et al., 2013).

It is difficult to get exact numbers of homeless because of the transient nature of homelessness. Homelessness encompasses those that are absolutely homeless living in areas not intended for human habitation or in shelters, the hidden homeless who are living with friends or relatives (often referred to as couch surfing or doubling-up), and those that are provisionally housed such as in hospitals, prison or interim housing (Frankish et al., 2005; Gaetz et al., 2013). Although there have been efforts made to estimate the numbers of homeless in Canada since 1987, the results have underestimated the numbers (Frankish et al., 2005; Gaetz et al., 2013; Hwang, 2001; Segart, 2012).

Recent attempts have been made to get more reliable data estimates on the numbers of homeless in Canada. Segaert (2012) in “The National Shelter Study: Emergency Shelter Use in Canada 2005 – 2009” estimated that 150,000 people used shelters annually across Canada. This number remained stable over the period of the study; however the length of stay of shelter users increased. This study did not include those staying at violence against women shelters, people in immigrant shelters or people who are homeless but not using homeless shelters (Segaert, 2012). Gaetz et al. (2013) in their study “The state of homelessness in Canada 2013”, estimate that 28,500 individuals are homeless each night in Canada. This figure includes those in emergency shelters, those in violence against women shelters, unsheltered homeless, those in temporary institutional accommodations and an estimation of the hidden homeless. This totals 200,000 Canadians annually at an estimated cost of \$7 billion dollars annually.

Literature Review

Homelessness and Health

The effects of homelessness on health have been studied for many years and are well reported in the literature. Although most studies are single site or look at subsets of the homeless, the consistency of the findings across sites and in different countries strengthens the validity of the findings. This review will provide examples from different countries but concentrate on more recent Canadian studies and reviews.

Sebastian (1985) reviewed the literature on homelessness in the United States citing the advent of psychotherapeutic drugs - which allowed for the treatment of the mentally ill in the community rather than in psychiatric hospitals and the subsequent

failure to develop adequate supportive housing - as contributing to homelessness.

Forchuk et al. (2011) also raised this issue.

Sebastian found that those who are homeless form a diverse group including single men, women, families, elderly and youth with each group having special needs. Sebastian reported differing educational backgrounds among the homeless, that they were generally unemployed or migrant workers and that many were physically handicapped. The lack of a mailing address made it difficult to get social assistance or find employment.

Physical problems of the homeless include exposure to temperature extremes, exacerbation of chronic illness, exposure to pollutants, constant mobility leading to sleep deprivation, and, foot and leg ulcerations. Infectious diseases are worsened by overcrowded, unhygienic living conditions. Delays in treatment or incomplete treatment of health problems meant that many conditions were more serious than in the general population. Homelessness can lead to mental distress such as loneliness, depression, low self-esteem, and loss of social supports and connections with family and friends - causing further distress. While recognizing that many are mentally ill, the author dispels the view that most people who are homeless are alcoholic citing an incidence of alcohol addiction from the literature of about 30%. The author identified that health care professionals need to be aware of the help needed by this population during hospitalization and discharge, to access and maintain community services, and ensure continuity in care.

In his review of homelessness and health, Hwang (2001) looked at how the homeless are counted and the definitions of homeless. He identified that estimating the homeless population using shelter counts underestimates the numbers because those

living rough or couch surfing are not included. His review of the literature focused on the health of the homeless in Canada but results are similar to those found in other countries. He found that medical problems included seizure disorders, chronic obstructive lung disease, arthritis and musculoskeletal problems. Chronic illnesses, such as hypertension, diabetes and anemia, were often not detected for long periods of time and were not adequately controlled after diagnosis. Infections of the respiratory tract and skin were common, and oral and dental health was poor. Foot disorders were common due to poor foot care and the lack of proper foot wear. The incidence of tuberculosis among people experiencing homelessness is higher than the general population. Inability to comply with long treatment regimes leads to prolonged infection and drug resistance. Hwang also found higher rates for HIV infection. Mental illness and substance abuse vary across subgroups of homeless with many of the homeless population suffer from both. Hwang found that the literature reported prevalence rates of approximately 60% for alcohol dependence, 30% for other drug addiction, and 20 to 40% for psychiatric illness. Exposure to extremes in weather, threats of violence, trauma, falls and unintentional overdose are common among the homeless population and lead to increased morbidity and mortality (Hwang, 2001).

Daiski (2007) did a qualitative study using semi-structured interviews with a convenience sample of 24 people who were homeless in one Canadian city to determine their perspectives on their health and healthcare needs. Subjects were recruited from city parks, on the streets, and from a women's drop-in centre. Seizure disorders, chronic respiratory diseases, musculo-skeletal problems and difficulty getting dental care were frequently mentioned. Although older participants related many of their physical health

issues to aging, younger interviewees demonstrated similar problems at younger ages. Many of the participants had lost employment due to injuries which lead to their homelessness and, although willing to work, found that jobs were difficult to get when using a shelter address or living on the street. They also commented on the fact that minimum wage and welfare does not allow one to maintain rent. Themes identified in this study included, lack of privacy and restrictive rules in shelters, fearing for their safety both in shelters and on the streets, and feeling excluded and invisible. Feelings of emotional distress frequently associated with mental health illness, addiction and crime were identified by all participants. Those that admitted to having an addiction expressed concern that when they were ready to go into rehabilitation; no services were available. Lack of continuity of services, being treated with disrespect, and excessive paper work for services were all seen as barriers to care and treatment. Recommendations from the study include changing attitudes of healthcare workers towards homeless, increased advocacy, and the provision of stable housing to improve health and break the cycle of homelessness. Shelters should be used only as short term accommodations and not as a long term solution to homelessness (Daiki). The diversity of ages and a single site are limitations of this study however the results obtained are all supported in the literature.

In their study Goering, Tolomiczenko, Sheldon, Boydell and Wasylenki, (2002) compared the characteristics of persons who experience homelessness for the first time with those that have experienced multiple episodes of homelessness in Toronto, Canada . They found that 64% of individuals facing homelessness for the first time had mental illness and 64% also reported substance dependence. High rates of unemployment were found among both groups, with those individuals who were homeless for the first time

less likely to be receiving social assistance. The rates of chronic physical problems were higher in those with multiple incidences of homelessness. Goering et al. found that early life factors may predispose individuals to chronic homelessness.

Hwang (2000) studied a group of homeless men in Toronto, Canada to determine if the high mortality rates among the homeless population reported in cities in the United States (US) also occurred in other countries. Hwang found that men who are homeless in Toronto experience a higher mortality rate at a younger age than the general population. Mortality rates were 8.3 % higher for the 18 to 24 year old group, 3.7 % higher in the 25 to 44 year olds, and 2.3 % among 45 to 65 year olds. Mortality rates were lower in Toronto than those in the US, and homicide as a cause of death is more common in the US cities. This study did not include women and only reported on the death rates of those who use shelters. The use of death certificates to obtain the cause of death was problematic as often the cause was listed as unknown or unspecified (Hwang, 2000).

In their discussion paper on homelessness, Riley, Harding, Underwood, and Carter (2003) described the contributing factors and changing social attitudes to the issue of homelessness in England. The social policies of the 1990's and the failure of policies intended to address homelessness has contributed to the increase in the numbers of homeless in England. Mikkonen and Raphael (2010) had similar findings regarding Canadian policies in their review on the effects of the social determinants of health on Canadians. Riley et al. review the health problems related to homelessness detailed in the literature – mental illness, drug and alcohol dependence, risk of violence, HIV, Hepatitis B and C, neurological disorders, anemia, cardiac disease, tuberculosis and other respiratory infections, and mortality rates greater than that for the general population.

Despite their poor health, the homeless population faces barriers to health care. The authors discuss the issues of increased emergency department use for primary care, the lack of continuity in care, and discharges from hospital to shelters or the streets. Suggestions made to improve the health of people who are homeless include interventions to integrate their care into mainstream health services, creating programs in hostels and shelters, and through exclusive services adapted to the specific needs of people who are homeless. Riley et al. end with a discussion on the need to address the root causes of homelessness by creating social policies that change the structure and attitudes of society toward the homeless and also create affordable housing. These findings and recommendations are echoed by Mikkonen and Raphael (2010) in relation to homelessness in Canada.

The prevalence of traumatic brain injury and its association with health were studied in men and women in Toronto shelters and meal programs (Hwang et al., 2008). The majority of participants with a history of traumatic brain injury were male, born in Canada, first experienced homelessness at a younger age and for longer periods, and had their injury prior to their first episode of homelessness. Rates of seizures, mental illness, and alcohol and drug addiction were significantly higher. Their general mental and physical health was poorer as measured on the SF-12 health survey. Limitations of this study were that participants required a health insurance number; it did not look at the cause of the injury, and relied on self report. The recognition of a history of traumatic brain injury and the understanding of behaviours associated with brain injury can improve the care and treatment of these individuals (Hwang et al., 2008).

The first Canadian study to look at oral health in individuals who are homeless involved those living in Toronto shelters (Figueiredo, Hwang & Quinonez, 2013). Only three percent of the study participants had no dental problems and the actual need for treatment was greater than the participants' perceived need.

Based on their work in Marseille, France, Raoult, Foucault and Brouqui (2001) reviewed infectious diseases in individuals who are homeless. The high prevalence of alcohol abuse, intravenous drug use, and smoking in patients who are homeless weakens the immune system causing biological abnormalities which predispose them to infections (Raoult et al., 2001). Lack of good foot wear, exposure to moisture and cold, and long periods of walking or standing also contribute to foot problems such as cellulitis, fungal infections, and ulcers. Untreated foot conditions can progress to osteomyelitis and gangrene which can lead to amputations. Respiratory tract infections are very common and death from a respiratory illness is seven times higher in people who are homeless than the general population. Tuberculosis is prevalent and spread through crowded shelters. Long treatment regimens make it difficult to adequately treat and the authors recommend admission to a supportive environment for the length of treatment to ensure compliance. Infestations of lice and pediculosis are common along with the infections they spread. The high use of injection drugs, needle sharing, and multiple sexual partners make patients prone to blood infections such as HIV and, Hepatitis B and C. Vaccinations, making syringes and condoms available, and the provision of foot care and adequate foot wear are interventions that the authors suggest would limit serious but avoidable infections in people who are homeless.

LeBrun-Harris et al. (2013) reported on data from the Health Resources and Services Administration's (HRSA) 2009 Health Center Patient Survey - the only nationally representative study done in the United States which includes both homeless and housed individuals. The HRSA provides funding for health care services to individuals who are underserved including people who are homeless, in a low-income bracket, underinsured, or publicly insured. Findings showed that people who are homeless were more likely to report an emergency department (ED) visit in the last year and have unmet health care needs than patients who were housed. Homeless patients who reported having a usual source of care had lower odds of reporting an ED visit. Results showed that addiction, mental illness, cognitive impairment, unstable housing, unemployment, and poverty worsen chronic and acute episodes of disease making them more difficult to treat. The greatest challenges in relation to health were in accessing, utilizing and maintaining primary health care services (LeBrun-Harris et al., 2013).

Baggett, O'Connell, Singer, and Rigotti (2010) reported on a national study done in the United States to look at the unmet health care needs of adults who are homeless. They found individuals who are homeless have higher rates of unmet healthcare needs which may be related to being uninsured, and the competing needs for food, shelter, and employment.

Homelessness and Healthcare

Primary health care for the homeless is also an issue in Canada despite its universal health care system. A study of homeless patients in Toronto found that less than half had a family doctor compared to 88% of Toronto residents (Khandor, Mason, Chambers, Rossiter, Cowan, & Hwang, 2011). Lost or stolen health cards and longer

periods of homelessness were frequently associated with a lack of primary health care. Khandor et al. found that although people who are homeless with chronic health conditions were more likely to have a family doctor than those without chronic conditions, more than half of those with chronic conditions do not have a family doctor. Forty percent of participants reported perceived discrimination by health care workers on the basis of homelessness, alcohol or drug use, or perceptions of drug seeking behaviours. This study did not address the care needs for those with other types of mental illness.

Raven, Carrier, Lee, Billings, Marr, and Gourevitch, (2010) found that homeless individuals are frequent users of inpatient and emergency department services. The decision to seek medical care is frequently related to their homeless status and lack of social supports (Raven et al., 2010). According to Hwang (2001), homeless adults are five times more likely to be admitted to hospital and their length of stay is longer than the general population. For the homeless, hospitals became their source of support (Raven et al., 2010). Those suffering with mental illness and substance abuse are inadequately treated, resulting in frequent admissions to mental health care beds (Hwang, 2001). On discharge, their transient life style and lack of supports make it difficult to ensure the best chance of healing to prevent complications and readmissions (Gundlapalli et al., 2005).

Studies have shown that homelessness acts as a barrier to discharge because of concerns related to a clean environment for recovery, compliance with treatment, and access to continued care. This results in increased hospitalization rates and prolonged length of stays (Gundlapalli et al., 2005). Despite lengthy, resource intensive planning (Gundlapalli et al., 2005), the homeless are frequently discharged to shelters (Hwang,

2001) which often results in an inability to comply with treatment, increasing the risk of complications and readmission (Tsilimingras & Westfall Bates, 2008).

A study by Forchuk, Russell, Kingston-MacClure, Turner and Dill (2006) estimated that in 2002 there were 194 discharges from psychiatric wards to “No fixed address” or homeless shelters based on data from local homeless shelters, as well as both acute care and tertiary care psychiatric wards in London, Ontario, Canada. The majority of the literature focuses on discharges from psychiatric units and only recently has research on interventions for effective discharges from acute care for people who are homeless appeared in the literature (Best & Young, 2009; Fader & Phillips, 2012; Okin et al., 2000). According to LeBrun-Harris et al., (2013) there is little research which directly compares the health status of housed and homeless patients. There are no studies specific to the orthopedic population.

Trauma and musculo-skeletal injuries are common among the homeless (Hwang, 2001), yet little is known about the specific effects of these injuries on the homeless or their long term consequences. Orthopedic patients are frequently discharged from hospital with weight-bearing restrictions, which can be challenging for patients with family and social supports, but present an even greater challenge for patients who are homeless. Incisions and internal fixation devices make them prone to infections. It is unknown how this affects the outcomes for homeless orthopedic patients.

The Social Determinants of Health

The social determinants of health are rooted in political, economic, social, and environmental aspects of our daily lives and impact health, disease, and disease severity (Raphael & Bryant, 2006; World Health Organization, 1986). Inequities in the social

determinants of health are “systematic and potentially remediable differences” (Starfield, Gervas, & Mangin, 2012, p.90) which affect the health of populations. Health interventions that focus on improving the average health of populations or on individual health do not address the cause of inequities related to the social determinants of health and often fail to reach those most affected by them (Starfield et al., 2012). Housing is a determinant of health which is affected by other social determinants of health such as socioeconomic status (McNeil, Guirguis-Younger, Dilley, Turnbull & Hwang, 2013). Poverty and homelessness limit a person’s ability for self care and adherence to treatment, while exposing them to greater risks such as infectious diseases and violence (Zlotnick, Zerger, & Wolfe, 2013). The social determinants of health will provide the theoretical basis for this paper.

The Joint Canada/United States Survey of Health (JCUSH) was conducted by Statistics Canada and the National Centre for Health Statistics between November 2002 and June 2003 to provide a comparison of the social determinants of health between the United States and Canada. While the two countries share similar social, economic, and cultural values, they have very different social welfare policies and health care programs (Prus, 2011). Information was collected on social factors (age, sex, race, nativity, and marital status); socioeconomic factors (education, employment status, and income); psychosocial factors (life satisfaction, wellbeing); behavioural risk (smoking, body mass index, physical activity,); and, health care system factors (receiving care, health insurance status). Prus (2011) used data from this study to compare the effects of the social determinants of health on the health of Canadians and Americans. Findings showed that while social factors are associated with health in both countries, differences in the size of

the effects exist. Prus found a very strong “socio-economic level to health gradient” in both countries with an increase of reported ill health for each \$1000 decline in income. Prus also found that those who relied on non-employment sources of income, and those with less than high school education were more likely to report poor health status.

Larson (2002) used the Short Form 12-item survey (SF-12) instrument to assess health in a sample of homeless persons and compared the results to those of the general population. The results showed that SF-12 scores were significantly lower for the homeless than all income groups of the general population with the exception of those earning less than \$15,000 per year. The studies done by Larson (2002) and Prus (2011) demonstrate the effect the social determinants of health (as represented by income) have on health.

Nursing as a profession has a history of caring for the most vulnerable in society. Florence Nightingale, recognized as the founder of nursing, cared for the poor and sick but also wrote of the importance of treating the conditions in which they lived and worked - as it is these conditions that caused (and continue to affect) their ill health (Falk-Rafael, 2005). A focus on health-care accessibility and health behaviours - which are considered proximal causes of disease - fails to address the social determinants of health - which are the distal causes of disease but have the most significance for impacting health (Reutter, & Kushner, 2010). Reutter and Kushner (2010) talk of nursing’s mandate to promote social justice and health equity through care of those experiencing inequities and through working to change the root causes of the inequities. They highlight the need for nurses to become educated on the political and social factors contributing to health inequities, and to learn political advocacy. They also recognize the need for research to

further understand how individuals are affected by inequities related to the social determinants of health.

People with orthopedic injuries face challenges in returning home due to weight bearing restrictions and mobility limitations. People who are homeless with orthopedic injuries face the same restrictions and limitations but without social support or a home to go to. How does this affect the ability of someone who is homeless to recover from an orthopedic injury? In order for nurses to advocate for the orthopedic population who are homeless, information is needed about their hospital admissions and factors that impact their health. Recognizing the differences in patient outcomes will allow for development of interventions to address inequities and improve the care and outcomes of this vulnerable population. A secondary benefit would be a decrease in emergency room visits, hospital length of stay, and re-admissions. This would lead to improved health care for homeless individuals at a lower cost. Decreased demands on our acute care health system will assist with improving emergency room wait times while decreasing costs.

Purpose of the Study

This is a retrospective study which examines orthopedic patients who are homeless compared to those who are housed in relation to hospital length of stay, infection rates after discharge, and attendance at follow-up appointments. It is anticipated that this information will serve as a foundation for a proposal to improve the discharge planning process for homeless patients within a Southwestern Ontario academic hospital. The research question is: What is the effect of housing status on hospital length of stay, the incidence of infection, and attendance at follow up appointments in the orthopedic population?

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Chapter Two

Manuscript

Background and Significance

People who are homeless are among those at the lowest end of the socioeconomic continuum representing one of the most disadvantaged groups in society. The interaction of societal and individual factors results in homelessness (Forchuk, Schofield, Joplin, Csiernik, Gorlick & Turner, 2011; Frankish, Hwang, & Quantz, 2005; Gaetz, Donaldson, Richter, & Gulliver, 2013), which causes psychological and physical stresses that adversely affect health. Research has shown that those who experience homelessness have higher rates of chronic disease, multiple medical problems, psychiatric illness, and addiction (Adams, Rosenheck, Gee, & Siebyl, 2007; Goering, Tolomiczenko, Sheldon, Boydell & Wasylenki, 2002; Hwang, 2001; Riley, Harding, Underwood, & Carter, 2003). They often lack medical insurance (Khandor, Mason, Chambers, Rossiter, Cowan, & Hwang, 2011), are more likely to have difficulty accessing health care, and to experience fragmented care (LeBrun-Harris et al., 2013; Riley, et al., 2003). The immediate needs for shelter and food compete with health care needs which results in delays seeking care (Baggett, O'Connell, Singer, & Rigotti, 2010; Hwang, 2001; Sebastian, 1985). People experiencing housing insecurity or homelessness are frequent users of emergency departments for primary care, as well as urgent and emergent health care services (Hwang, 2001; LeBrun et al., 2013; Riley et al., 2003). Once they access health care, they have higher hospitalization rates and prolonged lengths of stay (Hwang, Weaver, Aubry, & Hoch, 2011; Kushel, Vittinghoff, & Haas, 2001). On discharge, people who are homeless lack resources and social support to comply with treatment regimes and follow

up (Daiski, 2007; Hwang, 2001) leading to adverse events and readmission (Tsilimingras & Westfall Bates, 2008).

Although it is recognized that people who are homeless are prone to orthopedic injuries through long periods of walking with inadequate foot wear, trauma, and assaults (Hwang, 2001; Issar, Jahangir, Powell, Obremskey, & Sethi, 2011), the exact prevalence of such injuries is unknown. There is no research on the health outcomes of orthopedic patients who are homeless. Orthopedic patients are frequently discharged with weight bearing restrictions, fresh incisions, and internal fixation devices which present challenges to mobility and self-care, as well as present risk for infection. Orthopedic patients who are homeless lack the supports to assist them with these challenges. There is no research which explores the impact of homelessness on orthopedic patient outcomes or their use of acute care health resources. This research seeks to increase knowledge and understanding of the differences in outcomes experienced by housed orthopedic patients in comparison to those who are homeless.

Purpose of the Study

This retrospective study compares orthopedic patients who are homeless with those who are housed in relation to hospital length of stay, infection rates after discharge, and attendance at follow-up appointments. This information has the potential to inform the discharge planning process for homeless patients within a Southwestern Ontario academic hospital. The research question is: What is the influence of housing status on hospital length of stay, the incidences of infection after discharge and attendance at follow up appointments in the orthopedic population?

Theoretical Framework

Link and Phelan (1995) proposed that socioeconomic status (one of the social determinants of health) was a fundamental cause of health inequalities in that it: affects many disease and health conditions; affects disease outcomes through multiple risk factors, which can change through time; and influences the availability of resources that can be used to avoid or minimize health risk. Over time, the risk factors, protective factors, and diseases change - but socioeconomic factors continue to be associated with disease. A higher socioeconomic status gives access to power, money, and supportive social conditions that can be used to minimize or avoid disease or its consequences (Phelan, Link, & Tehranifar, 2010). The homeless population lack power, money, and supportive social conditions and the health benefits they provide. The social situation of homelessness affects a person's ability to meet their basic needs, access health care, and comply with treatment - increasing the complexity of the care they require (McNeil, Guirguis-Younger, Dilley, Turnbull, & Hwang, 2013).

Prus (2011) adapted a framework from House (2002) linking the social determinants of health to health outcomes. This model hypothesizes that macro-level determinants (socio-demographic and socioeconomic factors) influence health through their effects on micro-level factors such as psychosocial factors, behavioural risk factors, and health care system factors. The interaction of socio-demographic factors with socioeconomic factors affect health by determining the exposure to - and influence of - social stressors, health related behaviours, and access to medical care. In this study, I propose that housing status, as an indicator of socioeconomic status, determines health risk and health care access to affect health by increasing infection rates after discharge,

decreasing attendance at follow up, and increasing length of hospital stay for people who are homeless. (see Figure 1)

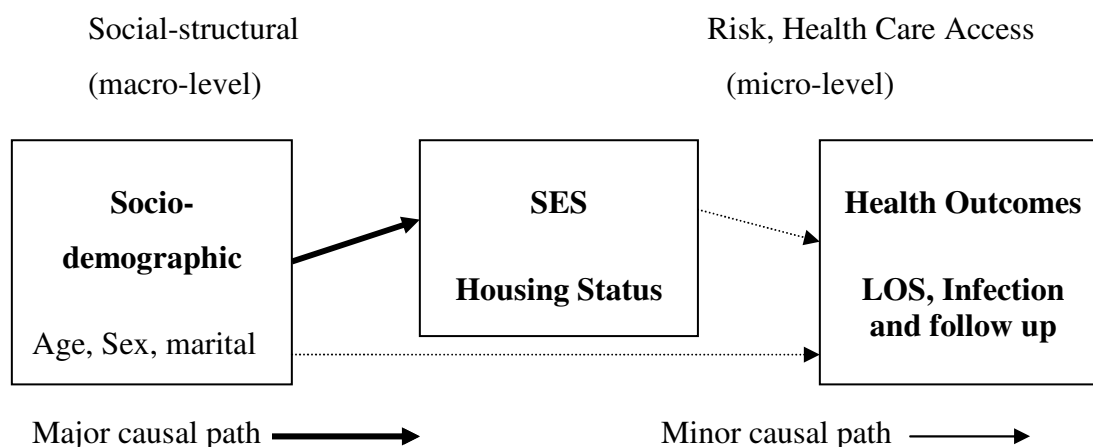


Figure 1: Conceptual framework for social determinants of health, housing status and health outcomes for orthopedic patients.

Adapted from: Prus, S. G. (2011). Comparing social determinants of self-rated health across the United States and Canada. *Social Science & Medicine*, 73, 50-59.

Review of the Literature

Homelessness - Definition and Typology

In 2012, the Canadian Homelessness Research Network (CHRN) published the Canadian definition of homelessness as:

“Homelessness describes the situation of an individual or family without stable, permanent, appropriate housing, or the immediate prospect, means and ability of acquiring it. It is the result of systemic or societal barriers, a lack of affordable and appropriate housing, the individual/household’s financial, mental, cognitive, behavioural or physical challenges, and/or racism and discrimination. Most people do not choose to be homeless, and the experience is generally negative, unpleasant, stressful and distressing.” (Canadian Homelessness Research Network, 2012: p. 1)

The typology describing the range of homelessness situations and the terms frequently used in the literature are found in Table 1. For the purposes of this research, homelessness will be defined as persons with no fixed address, or giving the address of a homeless shelter on hospital admission. This corresponds to the unsheltered and emergency sheltered groups. The outcome or dependent variables will be length of stay (LOS) defined as the number of days in hospital, the presence of infection after discharge, and attendance at follow up.

Table 1: Typology of Homelessness.

Term	Definition	Terms from the literature
Unsheltered	Individuals living on the streets or in places not meant for human habitation.	absolutely homeless, roofless or unsheltered
Emergency sheltered	Those living in shelters for people who are homeless, including family violence shelters.	Houselessness, emergency sheltered
Provisionally accommodated	<p>People who are living in temporary accommodations such as hotels or who lack secure housing.</p> <p>This includes those individuals who may be in transitional housing, living with others (couch surfing) or living in institutions such as hospitals or prisons and lack permanent housing arrangements.</p>	housing insecure
At Risk for homelessness	People who are not homeless but whose current economic or housing situation is precarious or does not meet public health and safety standards.	inadequately housed

Social Determinants of Health and Homelessness

The way in which a society distributes income and wealth; and the living and working conditions of its population; affect the ability of individuals to obtain food, housing, and education (World Health Organization, 2008). These factors have a greater influence over health than medical treatments or life style choices (Mikkonen & Raphael, 2010). Changes in Canadian federal and provincial government policies have eroded social programs resulting in greater income and wealth inequities (Bryant, 2004; Forchuk et al., 2011). This - combined with the promotion of biomedical model of health, individual responsibility, and life style choices as factors which affect health - has led to the general public being unaware of the social determinants of health and their influence on health (Raphael & Curry-Stevens, 2004). Research (using the social determinants of health as the theory to support it) is needed to increase knowledge of how the health of Canadians is being affected by inequities in the social determinants of health and to bring about changes in policy.

Homelessness and Health

Homelessness causes physiological and psychological stress and social exclusion, which contribute to illness and disease (Bryant, 2004; Mikkonen & Raphael, 2010). Poor nutrition, exposure to the elements, and crowded conditions in shelters exacerbate declines in health (Daiki, 2007; Frankish et al., 2005; Hwang, 2001). Those experiencing homelessness are at greater risk of developing chronic conditions such as respiratory illness, diabetes, high blood pressure, and musculo-skeletal disorders (Bryant, 2004; Gundlapalli, et al., 2005; Hwang, 2001); are frequently exposed to tuberculosis and HIV (Hwang, 2001; Raoult, Foucault, & Brouqi, 2001; Riley et al. 2003); and are more

likely to experience violence (Forchuk et al., 2008; Hwang, 2001). People experiencing homelessness have difficulty accessing, utilizing, and maintaining health services, which may further compromise their health (LeBrun-Harris et al., 2013). Disease severity is often greater because of delays in seeking health care, inability to adhere to treatment regimens, and cognitive impairments (Chin, Sullivan, & Wilson, 2011; Hwang, 2001).

The association of mental health illness and addiction with homelessness is well documented in the literature (Freund & Hawkins, 2004; Hwang, 2001; Levy & O'Connell, 2004; Raven, Carrier, Lee, Billings, Marr, & Gourevitch, 2010). These issues complicate treatment in acute care settings where staff often lack training to manage these problems. Behaviours associated with mental illness and addiction can affect compliance with treatment and follow up (Raven et al., 2010).

Homelessness and Healthcare

A survey of people who are homeless and marginally housed in San Francisco to assess patterns of ED use found that forty percent of the sample had used the ED at least once in the last year while eight percent had more than four visits (Kushel, Perry, Bangsberg, Clark & Moss, 2002). Factors contributing to ED visits were less stable housing, chronic medical conditions, victimization, mental illness, and substance use. Similar results were found by Moore, Gerdtz, Hepworth and Manias (2010) in an Australian study done to identify the characteristics of the patients using the ED. For almost half of those surveyed, the ED was the only source of health care. Limitations of this study included relying on self report and that there was no indication of whether the ED visits were for appropriate use.

In 2003, Han and Wells studied the use of services provided by Healthcare for Homeless Programs (HCHP) in eight communities in the US to determine their use in relation to rates of inappropriate ED use. Findings showed that those who used HCHP services had decreased odds of having an inappropriate ED visit. Limitations of this study are that there is no generally accepted definition of an “inappropriate ED visit” and the inability to get ED records in some settings. Other limitations include - data was collected only in the fall, only those who use soup kitchens were studied, and the use of self report.

Adams et al., (2007) did a retrospective cross-sectional secondary analysis of in-patient data at Veteran Affairs Medical Centres for veterans who were hospitalized in acute care treatment beds. The results found that the homeless population was younger than those who were housed (also found by Hwang, 2011) for all diagnostic categories, and that the age difference was even greater in those with medical surgical diagnoses. Significantly more homeless patients had a primary discharge diagnosis of a psychiatric disorder or substance use than veterans who were housed. It is unknown whether results are generalizable to the general population as there are specific outreach programs for homeless veterans, and they are more likely to have health insurance available to them which may not be available to civilians who are homeless (Adams et al., 2007).

Hwang, et al., (2011) compared the cost per hospital admission of housed and homeless patients admitted to medical, surgical and psychiatric units at an academic teaching hospital in Toronto, Canada over a five year period. Results showed that patients who are homeless are hospitalized younger and more frequently for psychiatric illness than patients who are housed. The average cost for a patient who was homeless was

\$2559 more than for patients who were housed. On the medical and surgical units the higher costs were due to length of stay and alternate level of care days while psychiatry units had higher costs related to higher intensity of treatment and cost of service per day. A limitation of this study was that homelessness was determined by administrative data which may have misclassified housing status in some cases. This study did not address the extent to which admissions could be avoided by providing primary care for people who are homeless. Hwang et al. felt that the use of respite care and outreach programs could result in savings for acute care hospitals.

Chin, et al., (2011) looked at the demographic and health data of homeless in-patients at St. Vincent's Hospital in Sydney, Australia to determine the health resources used by people who are homeless. The majority of patients were admitted with either a diagnosis of psychiatric illness or addiction and were admitted through presentation to the emergency department or to detoxification units. A comparison with the general population estimated that in-patients who were homeless used four times the expected number of health care beds than the general population. This study was done at an inner city hospital which may increase the number of homeless patients that are seen (Chin et al. 2011).

As hospitals became aware of the increased length of stay (LOS) and frequent use of EDs for primary care by patients who were homeless, programs to improve discharge processes for those who are homeless began to appear in the literature. Case management to coordinate community services with housing (Okin et al., 2000) or respite units (Buchanan, Doblin, Sai & Garcia, 2006; Podymow, Turnbull, Tadic and Muckle, 2006; Sadowski, Kee, VanderWeele, and Buchanan, 2009) have been reported. The Fourth

Street Clinic Respite Program in Salt Lake City, Utah provides four levels of respite services based on level of need, including services for families (Gundlapalli, et al., 2005). Limits of this program include a lack of secure funding and limited space. These programs not only show statistically significant reduction in utilization and costs of acute hospital services (Buchanan et al., 2006; Gundlapalli, et al., 2005; Okin et al., 2000; Podymow et al., 2006; Sadowski et al., 2009;), ED visits (Buchanan et al., 2006; Sadowski et al., 2009), readmissions (Gundlapalli, et al., 2005; Sadowski et al., 2009), and decreased complications (Gundlapalli, et al., 2005; Podymow et al., 2006), but also a reduction in psychosocial problems (Okin et al., 2000; Podymow et al., 2006), improved links to primary care (Okin et al., 2000; Podymow et al., 2006), and a decrease in homelessness (Okin et al., 2000; Podymow et al., 2006) and substance abuse (Okin et al., 2000; Podymow et al., 2006).

Effective discharge planning for patients experiencing homelessness begins on admission with an assessment of individual risks and needs, is interdisciplinary, includes the patient, family and community workers, and provides coordinated, integrated services from hospital to community with one point of contact for the patient (Backer, Howard & Moran, 2007; Best & Young, 2009; Greysen, Allen, Lucas, Wang & Rosenthal, 2012). Communication between hospitals and shelters, the provision of transportation, and discharges during hours when shelter beds can be accessed, were reported as important for effective discharge planning by participants in the study by Greysen et al. (2012). Policies and standardized practices related to the discharge of patients who are homeless need to be developed, as does training for discharge planners (Backer et al. 2007; Best & Young, 2009; Fader & Phillips, 2012). Hwang, Tolomiczenko, Kouyoumdjian, and

Garner (2005) reviewed interventions aimed at improving the health outcomes for individuals who are homeless and found that those interventions that included treatment and support for mental health and substance abuse issues had better outcomes.

Although the provision of housing is outside the scope of health care professionals and hospitals, partnering with community resources and advocating for affordable housing can improve the health of individuals who are homeless and decrease the demand for hospital services. Current research has focused on the provision of housing as an intervention to improve health and health care for the homeless.

A pilot study done by Forchuk et al. (2008) randomized a small group of psychiatric patients who were homeless into an intervention group that received housing and community support on discharge or to usual care. Within the intervention group, all but one participant continued to be housed at three and six months. Based on the success of this program, Forchuk et al. (2013) did further research with a larger sample size in acute and tertiary sites to determine if the intervention of providing pre-discharge assistance in finding housing, assisting with finances, and providing community supports within the hospital improves patient outcomes and leads to decreased hospital use. Staff reported that once housing was found, patients could then focus on therapy for their psychiatric issues, improving treatment and shortening LOS. The costs of implementing and maintaining the intervention were less than the increased medical costs associated with homelessness and shelter costs (Forchuk et al., 2013).

The National At Home/Chez Soi program is the largest trial of a housing first model done to date (Goering et al., 2014). This program took place in five Canadian cities with two thousand participants over two years. Results show that permanent

housing with community based supports geared to the needs of the individual was successful not only in providing and maintaining housing and decreasing costs over current programs, but also improved the health and functioning of individuals involved and reduced ED visits and hospital stays. Analysis of the project data also provided new knowledge about those individuals who are considered chronically homeless and unable to maintain stable housing. This data can provide the basis for gearing programs to their needs (Goering et al., 2014). A tool kit to help communities implement housing first has been created from this research.

Orthopedic Injuries and Infection

Infection rates for orthopedic procedures vary according to whether the procedure is elective or resulting from trauma, whether the fracture is open or closed, and by the site of the fracture. Infections have been defined by the presence of purulent drainage or osteomyelitis (Butterworth, Gilheany, & Tinley 2007; Harley, Beaupre, Jones, Dulai, & Weber, 2002; Motsitsi, 2008); purulence presenting after definitive wound closure (Harley et al., 2002; Butterworth et al., 2007; Motsitsi, 2008); diagnosed by the surgeon on clinical suspicion and deep cultures (Harley et al., 2002); and a positive wound culture. Butterworth et al., (2007) found that the rate of infections for elective foot and ankle surgery reported internationally was 0.5 to 6.5%. Higher infection rates were found in patients with multiple co-morbidities.

In a systematic literature review of articles on open fractures of the tibial shaft (the most common long bone injury), Papakostidis, Kanakaris, Pretel, Faour, Morell, and Giannoudis (2011) found a strong association between the severity of the open fracture and the risk of infection. Harley et al., (2002) studied the time to definitive fixation on

infection rates and found no differences in infection rates for open orthopedic injuries that received surgery within 13 hours. They also found that higher rates of infection were associated with greater severity of the fracture. In the Harley et al. study, 22 % of people with fractures developed infections. Bhandari, Zlowodzki, Tornetta, Schmidt, and Templeman (2005) looked at the use of external fixation devices in the initial treatment of femoral and tibial shaft fractures. Longer use of external fixation was associated with higher infection rates.

Pendleton, Cannada, and Guerrero-Bejarano (2007) looked at length of stay after femoral shaft fractures and found that the average LOS was 3.9 days. Increased LOS was associated with medical complications and lack of a definitive discharge destination. For those who required placement, they identified that earlier recognition of placement concerns would have facilitated discharge.

The only study found on orthopedic injuries and homeless patients was a case report by Zacherl, Kdolsky, Erhart, Boeckmann, Radler and Vecsei, (2006) of a trauma patient who was homeless and treated with an external fixator for an open proximal tibial fracture with avulsion of the tibial tuberosity. Due to complications of alcohol withdrawal and homelessness, the patient's length of stay was 48 days. The patient was seen again at the 72 day mark and at that time arrangements were made for removal of the external fixator. The patient did not show up for this appointment and efforts to reach him were unsuccessful. Ten years later this gentleman was admitted to the same hospital after a second trauma and found to still have the external fixator in place. Healing had occurred, the pin sites were free of infection and the fixator was stable. Healing without infection or breaking of the fixator on weight bearing was attributed to the long length of stay and the

pin site care the patient received prior to his discharge which allowed enough healing of the bone, and scar tissue formation around the pins, to prevent infection (Zacherl et al., 2006). This case highlights the prolonged length of stays and loss to follow up that may occur with patients who are homeless with orthopedic injuries.

Issar et al., (2011) describe the health and social issues of homelessness in relation to the orthopedic treatment. They suggest that higher levels of social stress, high risk environments, poorer health status, and poor nutritional status create physical and emotional stress which interferes with healing. Smoking, drug and alcohol addiction, and mental illness negatively affect outcomes after surgery. Malnutrition can cause endocrine abnormalities which may inhibit bone healing. Follow up care may be missed due to lack of health insurance, lack of transportation, and distrust of health care professionals. Social, physical, and medical issues associated with homelessness affect treatment as they increase the risk of complications at a younger age than the general population. The authors conclude that an understanding of the unique challenges presented by patients who are homeless is critical to optimal treatment and improved outcomes for this challenging and vulnerable patient population. No other studies were found on orthopedic injuries and homelessness.

Statement of the Problem

Research has shown that those who experience homelessness have higher rates of chronic disease, multiple medical problems, psychiatric illness, and substance use (Adams et al., 2007; Hwang, 2001; Riley, et al., 2003) which leads to higher hospitalization rates, prolonged length of stays, and mortality at a lower age (Hwang, 2001; Kushel, et al., 2001). Homeless patients discharged from hospital are unable to

comply with treatment regimes and follow-up due to a lack of resources (such as a safe place to store medications and appointment cards) and social supports (such as transportation to clinic visits). The inability to follow post-discharge treatment regimens may not be recognized by health care professionals when planning discharges (McNeil et al., 2013) and may lead to adverse events and readmission for the individual who is homeless (Tsilimingras & Westfall Bates, 2008). Although the homeless population is prone to orthopedic injuries (Hwang, 2001), there is little research on the outcomes of orthopedic patients who are homeless. An understanding of the impact of homelessness on the outcomes of orthopedic patients is needed in order to develop interventions which can improve health outcomes for these individuals.

Hypotheses

Orthopedic patients who are homeless experience longer hospital lengths of stay, higher infection rates, and lower rates of attendance at follow-up appointments than orthopedic patients who are housed.

Rationale for Hypothesis

Housing status affects a patient's ability to follow treatment regimens such as restrictions in weight bearing status, wound care protocols, or to complete a course of medications. In addition, the lack of a clean secure environment to promote rest and healing can increase the risk of complications such as infections. Homeless patients are often kept in hospital longer because of these concerns. Once discharged, patients who are homeless or in shelters have no safe place to keep appointment cards, prescriptions, or gait aids, which further compromises their ability to comply with treatment and follow up, - which in turn leads to higher risks of complications and poorer health outcomes.

Methods

Study Design

In this retrospective, case control study, patients aged 18 to 75 and admitted to the orthopedic service of a Level 1 trauma centre between April 1, 2008 and March 31, 2013 were considered for inclusion into the study. Patients were identified as homeless through the institution's database flag, by giving the address of one of the city's homeless shelters as their home address, or by having no fixed address. Housed patients were those with an address other than the address of a homeless shelter or no fixed address. Attempts were made to match the housed and homeless patients in terms of age, diagnosis, and sex. Within this institution, an orthopedic diagnosis could include fractures to bones or the spine, joint replacements, or infections to the bone, joint, or spine. The study was approved by the university and institution's ethics review board.

Power analysis done prior to the study using G*Power 3.1 to calculate the appropriate sample size for this study with a significance level of alpha equal to 0.05, a power level of 0.80, and a one-tailed t test for differences between two independent groups, predicted that 51 participants would be required for each group to detect a moderate effect size (0.5). As no research has been done in this area, determination of the effect size used by other researchers for similar studies was not possible. Consideration should be given to drop outs, which in a retrospective study is data that is missing in the chart (Gearing, Mian, Barber, & Ickowicz, 2006). Haber (2010) suggests adding 15% extra subjects to the sample size in order to ensure the ability to detect differences between groups. This added 8 participants for a total of 59 subjects required for each group. Due to the difficulty of finding adequate numbers of recognized homeless patients,

only 33 patients were in each of the two groups of this study. However, statistically significant results were obtained for the research question.

Data Collection Procedures

Patient information was gathered from the hospital's electronic patient database, Powerchart (Cerner Corporation), and through the paper chart when data was missing from the electronic record. Information recorded included admission and discharge dates; length of stay; sex; age; home address given; if this was a primary injury and when the primary injury occurred; surgical procedure and date as well as previous surgical procedures for this diagnosis and date; medical history; indications of infection on admission and on follow up (white blood cell count, erythrocyte sedimentation rate, C-reactive protein, temperature, documentation of redness, swelling, purulent drainage, antibiotics prescribed in hospital or on discharge); follow up appointment given on discharge and attendance at follow up; number of follow up appointments documented and number missed; admission from clinic and reason; emergency department visit related to this diagnosis and any within 6 months of admission; admission from emergency department related to this diagnosis and reason; and any additional surgical procedures related to this diagnosis. Data on socioeconomic status could not be collected as this information is not in the patient clinical record. Patients were excluded from the study if their admission was less than 24 hours or if the patient died while in hospital.

Sample

A sample of patients who were homeless was identified from the hospital data base by orthopedic diagnosis. These patients were then matched with a housed orthopedic patient on the basis of diagnosis, age and sex. There were thirty-six matched pairs of

housed and homeless patients identified plus two homeless patients that could not be matched. These two patients, although admitted to orthopedics service, were later transferred to other services more suited to their diagnosis and were therefore excluded from the study. One of the housed patients may have actually been homeless but staying with friends (couch surfing), and for this reason the data was not used and another match was obtained. One of the housed patients who had an admission of less than 24 hours was also excluded and a new match obtained. Two of the homeless patients had admissions of less than 24 hours and they and their matches were excluded from the study. The names of two homeless patients appeared on the list twice with a different matched housed partner for each admission. Since these were separate admissions with different diagnoses (rather than two admissions for the same problem) the data for each visit was used for both patients.

The name of one homeless patient appeared on the list twice so the first match was used. This error occurred because both the orthopedic and trauma databases were searched for patients who were homeless and had orthopedic injuries. The inclusion of the patient on both lists was not noticed until data collection had started. This resulted in thirty-three matched pairs of housed and homeless orthopedic patients in the final analysis.

Data Analysis

All data was collected by the researcher, coded, and entered into a spreadsheet. Missing data was coded as “not documented”. Non-parametric tests were used for categorical data and when the assumptions of the parametric tests were violated (ie: LOS was not normally distributed). Statistical analysis was performed using Chi-square (χ^2)

and Fisher exact tests to compare housed and homeless data, independent t-tests when comparing age, the Mann-Whitney U-test when comparing length of stay (LOS), and a Spearman correlation coefficient for LOS and age. The categorical variables type of surgery, infection on admission, and infection at follow-up were re-coded for analysis in order to decrease the number of categories with no counts or very low counts. Data was analyzed using the Statistical Package for the Social Sciences (SPSS) version 21. Statistical significance was set at $p = .05$.

Results

Demographic Data

The age range for the housed group was 19 to 71 with a mean age of 48.4 years and a standard deviation of 16.6 years. The homeless group ranged in age from 18 to 69 with a standard deviation of 14.7 years and a mean age of 44.8 years. Both groups were predominantly male but the housed group was 70% male compared to the homeless group which was 85% male. This was the first admission for this diagnosis for 88% of the housed group and 85% of the homeless group. (See Table 2)

A comparison of the diagnoses for each group is shown in Table 3. Diagnoses were similar - which is expected as attempts were made to match the groups on diagnoses. The housed group had a lower incidence of multiple fractures (3%) compared to the homeless group (12%). Lower extremity fractures were more common in the housed subjects, 24% versus 18%. Although sixteen of the housed patients and eighteen of the homeless patients were admitted with suspected infections, documentation of actual infection was present in only nine (27.3%) of the housed patients and fifteen (45.5%) of the homeless patients. Documentation of a confirmed infection on admission

was missing for one of the housed patients. Although the diagnosis of infection on admission was matched for the two groups, there was a statistically significant difference in confirmed infections on admission between the groups.

Table 2: Demographics.”

Housing Status		Housed N=33	Homeless N=33
LOS	Mean	6.52	14.27
	Median	4.00	5.00
	SD	8.39	22.28
	Min	1	1
	Max	42	100
Age	Mean	48.36	44.79
	Median	53.00	46.00
	SD	16.59	14.65
	Min	19	18
	Max	71	69
Sex	Female	30.3%	15.2%
	Male	69.7%	84.8%
First Admission for Dx*	Yes	87.9%	84.8%
	No	12.1%	15.2%
Confirmed Dx of Infection	Yes	27.3%	45.5%
	No	69.7%	54.5%
	Missing	3.0%	0.0%

*Dx - Diagnosis

Table 3: Comparison of Diagnosis for Housed and Homeless Patients.”

Diagnosis	Housed		Homeless	
	Frequency	Percent	Frequency	Percent
Upper extremity fracture	1	3.0	1	3.0
Lower extremity fracture	8	24.2	6	18.2
Hip fracture	1	3.0		
Pelvic fracture	1	3.0	1	3.0
Spine fracture	1	3.0		
Multiple fractures	1	3.0	4	12.1
Arthritis	4	12.1	3	9.1
Septic joint/abscess/osteomyelitis	13	39.4	14	42.4
Spine infection	3	9.1	4	12.1
Total	33	100.0	33	100.0

Length of stay (LOS) for the housed group varied from 1 to 42 days with a standard deviation of 8.4 days and a mean LOS of 6.5 days. For the homeless patients, LOS ranged from 1 to 100 days with a standard deviation of 22.3 days and a mean LOS of 14.3 days. Table 4 compares co-morbidities for the two groups. Cardiovascular disease, respiratory disease and diabetes were more common in the housed group while the incidence of psychiatric illness and addictions were much higher in the homeless group.

Individuals who were homeless also had a higher incidence of “other” co-morbidities. “Other” co-morbidities experienced by both groups included previous fractures, previous trauma, acute brain injury, seizure disorder, hypothyroid, while one of the housed subjects was quadriplegic, one of the homeless subjects was paraplegic. The housed group also reported migraines, gout, cancer of the prostate, kidney disease, obstructive sleep apnea and obesity. The subjects who were homeless had documentation

of previous infections including sexually transmitted infections, HIV, hepatitis B and C, cirrhosis, falls, chronic pain, carpal tunnel, hernia, cholecystitis and celiac disease.

Table 5 compares the mechanisms for injury for the two groups. Mechanisms of injury were similar with the exception that no housed patients had a primary diagnosis of infection without prior trauma or injury whereas two of the homeless patients presented with infections without any reported prior history of trauma or injury.

Table 4: Comparison of Co-morbidities between Housed and Homeless Groups

Co-morbidity	Housed		Homeless	
	Sum	Percent	Sum	Percent
Cardiovascular disease	10	30.3	3	9.1
Diabetes type 1 or 2	5	15.2	2	6.1
Respiratory disease	2	6.1	0	0
Neurological disease	1	3.0	0	0
Arthritis	7	21.2	7	21.2
Osteoporosis	0	0	0	0
Peripheral vascular disease	2	6.1	1	3.0
Cancer	0	0	0	0
Gastrointestinal disease	5	15.2	6	18.2
Psychiatric illness	0	0	17	51.5
Drug abuse	1	3.0	23	69.7
Alcohol abuse	0	0	13	39.4
Other co-morbidities	12	36.4	19	57.6
N	33		33	

Table 5: Comparison of Mechanism of Injury

Mechanism of Injury	Housed		Homeless	
	Frequency	Percent	Frequency	Percent
Fall	8	24.2	8	24.2
Motor Vehicle Collision	3	9.1	2	6.1
Other trauma	6	18.2	5	15.2
Primary Infection			2	6.1
Other*	10	30.3	11	33.3
Unknown	6	18.2	5	15.2
Total	33	100.0	33	100.0

*Other = drug injection, arthritis, previous surgery, chronic ulcers, bee sting, peripheral vascular disease

Statistical Analysis

Relationships between variables. Attempts were made to assess for relationships between variables that may influence the outcome of the hypothesis testing. No relationships could be determined with diagnosis, mechanism of injury, and type of surgery because the number of different categories left too many cells with counts of one or less. Attempts were made to decrease the number of surgery options by re-categorizing them but this did not correct the problem.

A series of Chi-square tests were performed to examine the relationship between the variables infection on admission, infection at follow-up, attendance at follow-up and housing status; and the variable sex. The variables infection on admission and infection at follow-up were adjusted to remove those patients with no documentation of whether an infection was present or not on admission in an effort to limit the incidence of low counts. This resulted in the loss of data for one patient (1.5% of data) for infection on

admission and twenty-three patients (34.8% of data) for infection on follow up. No significant relationship was found between infection on admission and sex, $\chi^2 = .00$ with $p = 1.00$ with 1 degree of freedom (df). There was also no statistically significant relationship between sex and infection at follow-up ($\chi^2 = .77$ $p = .38$ with 1 df), sex and attendance at follow-up ($\chi^2 = .70$, $p = .40$ with 1df) or sex and housing status ($\chi^2 = 1.38$, $p = .24$ with 1 df). Given that the two groups were matched for diagnosis and sex, this would be an expected result. Small numbers in our sample size may also affect the results of the tests.

An independent t-test was used to assess for relationships among the categorical variables - housing status, infection on admission, infection at follow-up and sex - and age in years. Since length of stay is positively skewed, a Mann-Whitney U-test was used to assess for relationships between LOS and the categorical variables infection on admission, infection at follow-up, attendance at follow-up, and sex.

The mean age for the housed group is 48.36 years with a standard deviation of 16.59 years while the mean age for the homeless group is 44.79 years with a standard deviation of 14.65 years. For age and housing status, homogeneity of variance exists as shown by the Levene's test. The t statistic is .93 with 64 df at $p = .36$ which shows no statistically significant difference between age and housing status. Homogeneity of variance also exists for age and infection on admission which shows a t statistic of .95 with 63 df at a $p = .35$ showing no statistical significance. For age and infection at follow-up, homogeneity of variance exists and the t statistic is -.86 with 41 df at $p = .40$ showing no statistical significance. Homogeneity of variance also exists for age and attendance at follow-up which shows a t statistic of -.14 with 62 df at $p = .89$ showing no

statistically significant difference between age and attendance at follow-up. For age and sex, homogeneity of variance exists and the t statistic is 1.12 with 64 df and $p = .27$ which also shows no statistical significance.

The median length of stay (LOS) for males was 5.0 days and 4.0 days for females. The Mann-Whitney U-test looking at LOS and sex showed no statistically significant relationship at $p = .96$. The median LOS for housed patients who attended follow-up was 4.0 days and 6.0 days for those who did not attend follow-up. This was found to be statistically significant at $p = .01$. For those who had an infection on admission the median LOS was 6.5 days and 4.0 days for those who did not have an infection on admission. This was also found to be statistically significant at $p = .01$. Those subjects with longer LOS were more likely to have an infection on admission and more frequently did not attend follow-up.

A Spearman correlation coefficient was used to assess the relationship between LOS and age as LOS is skewed which violates the assumptions for using a Pearson correlation coefficient. The computed Spearman correlation coefficient of $-.11$ was obtained with $p = .38$. Therefore, there is no statistically significant relationship between length of stay and age (at $\alpha = .05$ level)

Tests of hypotheses. Statistical analysis was then done to test the hypothesis: “Homeless orthopedic patients experience longer hospital lengths of stay, higher infection rates after discharge, and lower rates of attendance at follow-up appointments than orthopedic patients that are housed”.

Length of stay and housing status were examined using a Mann-Whitney U-test since LOS is positively skewed. The median LOS for housed patients was 4.0 days and

5.0 days for subjects who were homeless. The test showed $p = .03$ so it can be concluded that there is a statistically significant difference in the LOS between housed and homeless orthopedic patients with patients who are homeless showing longer LOS.

A Chi-square test was done to test whether there was a difference between housing status and attendance at follow up. This showed that 73.8% of those that attended follow up were housed patients and 26.2% were homeless patients. Data were missing for two patients (3% of the data). A statistically significant relationship between housing and attendance at follow up was found with $\chi^2 = 24.12$ with 1 df and $p < .01$. The odds of a housed patient attending follow up were .04 times higher than patients who were homeless at a significance level of $\alpha = .05$.

Determination of the difference between housed and homeless patients requiring admission from clinic was attempted using a Chi-square test. A Fisher's exact test was used as the counts in 50% of the cells were less than five. One of each of the housed and homeless patients required admission from clinic. This showed no statistically significant difference at $p = 1.0$ for a 2-sided Fisher's exact test.

The difference between housing status and infection at follow up was tested using a Chi-square test. The unadjusted variable infection at follow up was used for this analysis. Five patients in each of the housed and homeless groups had documented infections at follow up. This constituted 15.5% of the housed patients who attended follow up but 45.5% of the homeless patients that attended follow up. The infection rate at follow up for both groups was 11.6%. Data were missing on one (3.0%) of the housed patients and twenty-two (66.7%) homeless patients. The high percentage of missing data may affect the accuracy of the results of this test. The results show $\chi^2 = 38.11$ with 2 df

and $p < .01$. These results suggest that there is a statistically significant difference between housed and homeless patients and the incidence of infection at follow up. However, it must be noted that only eleven (33.3%) of the homeless patients attended follow up (See Table 6), so the results must be interpreted with caution. Later analysis of emergency department visits due to infection adds support to this finding.

Additional analysis. Looking at housing status and emergency department visits related to this diagnosis, it is noted that three (9%) of housed patients had visits to the emergency department (ED) related to this diagnosis (Dx) and twenty-one or 64% of patients who are homeless visited the ED for issues related to this diagnosis (Table 6). A much higher percentage of patients who were homeless had an ED visit compared to those that attended follow up. A Chi-square test showed $\chi^2 = 21.21$ with 1 df and $p < .01$. There is a statistically significant relationship between housing status and visits to ED with patients who are homeless having a greater number of ED visits. The odds of having an ED visit were 17.5 times higher for patients who were homeless than for those that were housed.

Table 6: Comparison of Follow up and ED visits

	Housed	Homeless
Follow up Visit Given on D/C	33 (100%)	31 (94%)
Attended Follow Up	31 (94%)	11 (33%)
Infection Noted at Follow up	5 (15%)	5 (15%)
ED visit related to this DX	3 (9%)	21 (64%)
Admission from ED	2 (6%)	13 (39%)

Furthermore, when one looks at the reason for the ED visit (Table 7), one of the housed patients and twelve of the homeless patients were seen for possible infections.

Admissions from ED visits show that two (6%) of the housed patients and thirteen (39%) of the homeless patients were admitted from the ED (Table 6).

A Chi-square test comparing housing status and ED admissions shows $\chi^2 = 8.63$ with 1 df and $p < .01$ showing a statistically significant relationship between housing status and admissions from ED. For those that were homeless in this study, the odds of being re-admitted from the ED are 10.08 times greater than for the housed subjects. In looking at the reasons for the ED admission (Table 7), it is shown that the majority of admissions were for infections. Both of the housed patients admitted from ED and twelve of the thirteen homeless patients admitted from ED had a diagnosis of infection. This supports the hypothesis that homeless orthopedic patients are more likely to experience infection as a complication of orthopedic injuries.

Table 7: Reason for Emergency Department visit

Reason for admission	Housed		Homeless	
	Frequency	Percent	Frequency	Percent
Infection	1	3.0	12	36.4
Pain	2	6.1	4	12.1
Other			5	15.2
Total	3	9.1	21	63.6
Missing	30	90.9	12	36.4
Total	33	100.0	33	100.0

Looking at the number of visits to the ED in the six months following discharge for this diagnosis - but for reasons not related to this diagnosis (Table 8) - shows that three housed patients had additional visits to the ED (two patients had one additional visit and one patient had two additional visits). The numbers are quite different for the

homeless population where twenty-eight had ED visits not related to this diagnosis, and the frequency of those visits varied from one to forty-three visits. This is in keeping with the literature which shows increased ED use by homeless patients.

Table 8: Visits within 6 months of this admission

No. of visits	Housed		Homeless	
	Frequency	Percent	Frequency	Percent
1	2	6.1	6	18.2
2	1	3.0	2	6.1
3			6	18.2
4			2	6.1
5			3	9.1
6			2	6.1
7			2	6.1
9			1	3.0
13			2	6.1
27			1	3.0
43			1	3.0
Total	3	9.1	28	84.8
Missing	30	90.9	5	15.2
Total	33	100.0	33	100.0

Data were also collected on those patients that required further surgery related to this diagnosis. For the housed population four patients required a second procedure compared with six of the patients who were homeless. Comparison of the surgical procedures required (Table 9) shows that three of the homeless patients required multiple surgical procedures. The statistical significance of this cannot be tested because of the low counts.

Table 9: Further Orthopedic Surgical Procedures required after this diagnosis

Procedure	Housed		Homeless	
	Frequency	Percent	Frequency	Percent
Revision of Amputation	1	3.0		
Revision Irrigation and Debridement (I & D)	1	3.0	2	6.1
Total Knee Arthroplasty	1	3.0		
Below Knee Amputation	1	3.0	1	3.0
I & D Removal of Hardware, & Repeat I & D			1	3.0
I & D, skin graft, (later) & Below Knee Amputation			1	3.0
I & D Multiple joints (4 surgeries)			1	3.0
Total	4	12.1	6	18.2
Missing	29	87.9	27	81.8
Total	33	100.0	33	100.0

Discussion

The results of this study show that orthopedic patients who are homeless have longer lengths of stays, do not attend follow up appointments, and are more likely to experience infection as a complication of their surgery than housed patients. They have more emergency department visits and experience more frequent re-admissions from the emergency department. These differences are shown to be statistically significant. These findings are similar to results found in other studies of LOS and ED use (Hwang, 2001; Hwang et al., 2011; Kushel et al., 2001; Moore et al., 2010). The issue that emerges is

how to provide improved care to this challenging population and reduce the burden on the acute care health system. Patients who are homeless carry a personal burden in the many barriers they face to receiving care. The lack of social supports and a safe discharge destination interferes with their ability to comply with post-hospital treatment. They lack a safe place to keep appointment cards or the resources to keep track of when appointments are. They lack transportation to appointments and the more immediate needs for food and shelter often compete with their health care needs. Without a discharge destination, it is difficult to put community supports and treatments in place, (such as IV antibiotics), and they lack transportation to attend clinics for treatment. Issues of particular concern to the orthopedic patient population include the ability to maintain weight bearing restrictions, and the concern for inserting long term intravenous access in those with a history of intravenous drug use which may mean that patients are discharged on less optimal oral antibiotic treatment or remain in hospital. Even with oral antibiotics, people who are homeless lack the resources to buy prescriptions and lack a safe place to keep them for the extended time frame (four to six weeks) that antibiotics are needed for treating infected hardware and osteomyelitis.

Levy and O'Connell (2004) found that homelessness was often not recognized or addressed as part of the discharge planning process which puts patients at risk of being discharged to the streets. In other circumstances, it may only be realized once discharge planning has started which delays the discharge. Inadequate discharge planning was found to be a major factor in contributing to patients being discharged to homelessness (Backer, et al., 2007). The literature suggests that every patient should be asked questions regarding their housing status on admission so that patients who are homeless are

identified. This can also identify those patients who are at risk for losing housing because of a hospital stay or injury (Best & Young, 2009). Once the risk of homelessness is identified, resources such as social workers and special community liaison teams can be activated to assist with finding supportive housing and community services for the patient on discharge (Backer et al., 2007).

Short term solutions which help hospitals manage LOS and ED use by people who are homeless, yet do little to address the inequalities related to the social determinants of health (the fundamental causes of homelessness), must be avoided. The literature presents many examples of interventions that can prevent discharge to homelessness. Best and Young (2009) present a framework for care of homeless patients in hospital in order to provide safer discharges, comprehensive care, and improved outcomes. Respite units outside of acute care, often run in conjunction with city shelters, have been described as a possible solution to discharging to homelessness or shelters (Buchanan et al., 2006; Fader & Phillips, 2012; Gundlapalli et al., 2005; Podymow et al., 2006; Sadowski et al., 2009;). They allow patients to be discharged from acute care but provide a safe supervised discharge destination that improves the chances of full treatment being completed and follow up being attended. Many of these interventions were first used with discharging mental health patients and are spreading into acute care. An important aspect of these units are the links with community supports to assist these patients to obtain permanent housing, resources to assist with mental health and addiction issues, and assistance in finding employment.

Housing First programs which focus on providing stable housing with community supports are being used in many countries to manage homelessness. Forchuk et al.

(2013), describes an intervention using community supports within the hospital setting to assist mental health patients to find housing prior to discharge in London, Ontario. The housing first model is gaining momentum and emerging in Canada as a key response to homelessness (Gaetz, 2013). The At Home/Chez Soi project was initiated in 5 cities across Canada and is one of the largest randomized trials of a housing first program (Goering et al., 2014). It followed 2,000 participants over 2 years and found that Housing First was able to obtain and retain housing for participants at a much higher rate than the control group of usual treatment in each of the cities. The authors report an average cost savings of \$9.60 for the high needs group and \$3.20 for moderate needs group for every \$10.00 invested in the program when all costs incurred by society for homelessness were considered. In terms of health care, initial findings show that emergency room and outpatient visits were reduced (Goering et al., 2014).

Addiction and psychiatric disorders were found to be much greater in people who were homeless compared with those who were housed in this study. Similar results were found by LeBrun- Harris et al. (2013) in their study comparing people who were housed and homeless in the US. The prevalence of mental illness and addiction among individuals who are homeless is well documented in the literature (Adams et al., 2007; Goering et al., 2002; Hwang 2011; Mikkonen & Raphael, 2010;). Spooner (2009) suggests that research on the social determinants of health and alcohol and drug use is needed, as often policies and interventions aimed at treating the problem cause further alienation and violence. Johnson and Fendrich (2007) found that drug use often followed the first incidence of homelessness while Thompson, Wall, Greenstein, Grant, and Hasin (2013) found that alcohol use, drug use, and poverty independently increased the risk of

first time homelessness. The relationship of homelessness and drug and alcohol use is complex and not well understood.

This study found that the housed patients with a diagnosis of infection on admission all had a history of trauma but two of the patients who were homeless had a diagnosis of infection on admission without a prior history of trauma. Intravenous (IV) drug use is associated with infections in patients who are homeless due to unsafe injection practices such as shared needles (Raoult et al., 2001). Both patients did have a history of IV drug use which could account for their diagnosis.

Those involved in health care are situated to recognize the implications of disparities in the social determinants of health and through research and political action can influence public policy, advocate for social change, and work with all levels of community and government stakeholders to achieve changes to reduce the incidence of homelessness. A study by Desai, Patel, Abdo, Lawendy, and Sanders, (2014) showed how changes to government policy in response to research demonstrating the adverse effects on health for hip fracture patients reduced wait times and costs for these patients and improved outcomes. Similar work is needed to advocate for those who are homeless.

Limitations

A weakness of this study is that it is a retrospective design, so matching the homeless patient with a similar housed patient may be less precise than with prospective studies. According to Hess, (2004) the target population in chart reviews is usually not well defined which can lead to selection bias and confounding factors which can affect results. Analysis showed no statistically significant differences in the two groups for age and sex. A major difference in the two groups was found in relation to co-morbidities. It

may be that mental health and addictions are less likely to be disclosed and documented for housed patients than for homeless patients which represents a bias in the collection of information (Alemayehu & Cappelleri, 2013; Bahm, & Forchuk, 2006; Polit & Beck). However, since the difference was large and supported in the literature, the probability is that it reflects a true difference in the populations.

The low numbers (sixty-six patients) are insufficient to detect uncommon events so it is possible that other factors not apparent in this chart review account for any differences found between the two groups. Notable limitations to chart review research include incomplete or missing documentations and poorly recorded or absent information (Gearing et al., 2006; Giuffre, 1997). In this review, missing data was described as not documented and declared in the analysis of data.

Conclusion

Orthopedic patients who are homeless experience longer lengths of stay, increased infection rates, and are less likely to attend routine follow up appointments than housed orthopedic patient. People who are homeless are more likely to use emergency departments for issues related to their surgery and are more frequently readmitted for these concerns. Solutions to improving the care of people who are homeless while decreasing the burden on the acute health care system lie in a multidisciplinary approach to their care and discharge planning while in hospital, and supportive services within the community. However, long term solutions are needed to reduce homelessness, and these involve recognition and action on the social determinants of health. Those working at all levels of health care are situated to recognize and work toward social changes which can reduce homelessness.

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Chapter Three

Discussion

The results of this study show that people who are homeless and have orthopedic injuries have longer lengths of stay in hospital and increased rates of infection and readmission. The poorer health outcomes associated with homelessness have implications for the practice and education of health care workers as well as requiring further research on what programs will result in better outcomes for patients who are homeless and require acute care. Given that homelessness is a social problem, this study also has implications for government policy related to homelessness. This chapter provides a brief discussion on the implications in all four areas.

Implications for Practice

The findings of this study demonstrate that patients who are homeless are at greater risk for complications requiring readmission and have higher incidences of emergency department use for care. Hospitals need to develop discharge processes that are effective in meeting the unique needs of this vulnerable population. Such processes would allow for the early identification of patients who may be homeless or in danger of becoming homeless as a result to their hospitalization or the injuries they have. According to Backer et al. (2007), discharge planning is part of a continuum of care from assessment and treatment to coordination of care in the community. Admission histories and assessments should include questions regarding housing which would identify not only those who are homeless but those who are inadequately housed or in danger of losing housing (CNA, 2005; Best & Young, 2009). Once identified these patients require multidisciplinary involvement in their discharge planning to ensure that they are not discharged to homelessness. The creation of dedicated staff roles to assist in the discharge

planning for all patients identified as homeless can lead to more efficient and effective planning for this population (Best & Young, 2009). Fader and Phillips (2012) suggest that emergency staff be trained to not only recognize that a patient is homeless, but to probe for the underlying reasons for presentation to the emergency department and factors that will affect the patient's ability to follow discharge plans. These factors may contribute to the risk of readmission. Discharge instructions and care which are adapted to the consideration of homelessness increase the ability of the person who is homeless to follow the treatment post discharge. Follow up care which is provided close to shelters and does not require specific appointment times increases the likelihood that these appointments will be attended (Best & Young, 2009). Links to community and social services have been found to be essential to improve outcomes and decreased re-admissions to hospital (Best & Young, 2009). Safe transportation from hospital to a discharge destination is often overlooked but found to be important to patients who are homeless and lacking the ability to provide their own transportation (Greysen, Allen, Lucas, Wang & Rosenthal, 2012).

The literature has many examples of effective discharge programs that ensure patients who are homeless are discharged to appropriate facilities for their needs which, in turn, reduces lengths of stay, decreases complications, allows for improved self-care, and decreases readmission rates and visits to emergency departments (Fader & Phillips, 2013; Forchuk et al., 2013; Gundlapalli et al., 2005; Podymow, Turnbull, Tadic, & Muckle, 2006; Sadowski, Kee, VanderWeele, Tyler, & Buchanan, 2009). Although these discharge programs may incur a cost to implement – a factor which may account for the

reluctance to implement them - they have been showing to be cost-effective over time (Backer et al 2007).

Implications for Education

McNeil, Guirguis-Younger, Dilley, Turnbull, and Hwang (2013) discuss the importance of clinicians having knowledge and training on the social determinants of health and how to address them when caring for patients who are homeless. Their study of six major Canadian cities showed that participants reported having no training on the social determinants of health and little exposure to those who are homeless during their training. These clinicians found that the assumptions they held with regard to patients being housed, having access to nutritious food, transportation and the ability to pay for treatments did not apply and could interfere in providing adequate care to their patients who were homeless. Education on the social determinants of health and in unique care needs of those who are homeless is being provided in some training programs for physicians and nurses but needs to be included in all curriculums for clinicians. It is imperative that this knowledge is also offered through continuing education to ensure that those already practicing have the opportunity to attain and apply these principles to their practice (Levy & O'Connell, 2004; McNeil et al., 2013).

Nickasch and Marnocha (2009) interviewed individuals who were homeless and a common theme mentioned by participants was the lack of compassion and respect from health care workers. The perception of discrimination by patients who are homeless can cause delays in these individuals seeking future medical care (Khandor, Maon, Chambers, Rossiter, Cowan, & Hwang, 2011). Education on a philosophy of harm reduction rather than fixing or curing would assist nurses to more effectively meet the

needs of homeless patients who also have an addiction (Pauly, 2008). The adoption of harm reduction strategies combined with knowledge of the effects of homelessness on health can lead the development of initiatives to link health care services with social services (Pauly, 2008a).

In their study, McNeil et al. (2012) found that those involved with patients who are homeless recognized the need for advocacy and activism for social change related to homelessness and health, but lacked training in this area. They suggest that training in patient advocacy also needs to be part of the education of healthcare workers. Patient advocacy means increasing the awareness of inequities and inequalities that affect health and using evidence to influence practice and policy (CNA, 2009). Nurses with knowledge of the effects of the social determinants of health can spread this information both formally and informally to change practices which discriminate against those who are homeless. The Code of Ethics for Registered Nurses developed by the Canadian Nurses' Association (CNA) state that nurses should work at both the individual and collective level to eliminate social inequities. CNA provides examples and support tools for nurses to assist them in advocating for change at both the practice and policy level.

Implications for Policy

Partnerships between hospitals, community programs and community health care providers to create respite units which would provide safe environments for healing and recovery while providing social supports would ensure that patients who are homeless receive the post-discharge care they require (Fader & Phillips, 2012; Moore, Gerdtz, Hepworth, & Manias, 2011). Through federal government policies, Australia has adopted a policy that no patient is discharged from a hospital to homelessness and provides

supported accommodations to support this goal (Moore, et al., 2011). Canada needs to adopt a similar policy with the development of resources to support it.

Canada is a recognized leader in the theoretical discussions on the social determinants of health and in health promotion (Frankish, Veenstra, & Moulton, 1999; Raphael, 2003). Documents produced by different levels of government throughout Canada echo the need to address the social determinants of health in order to improve the health of all Canadians (Raphael, 2003; Reutter & Kushner, 2010). Canadian health policy, however, continues to support the individual health risk model which focuses on the individual and their responsibilities in their health (Raphael, 2003; Raphael & Bryant, 2006). Dealing with income inequality at the government and policy level is essential to improve the health of those who are disadvantaged through provision of adequate financial resources to access adequate housing, food and other essentials for health (Mikkonen & Raphael, 2010).

Ending homelessness will require governments at all levels to cooperate in the development of policies which will allow the integration and coordination of services across ministries and all levels of government (Gaetz, Donaldson, Richter, & Gulliver, 2013). It will also require government investment and incentives to increase the supply of affordable housing including supportive housing for those with complex physical and psychological needs (Gaetz et al., 2013; Mikkonen & Raphael, 2010).

Advocacy is imperative to pressure governments to create housing initiatives (Mikkonen & Raphael, 2010), yet according to Raphael and Bryant (2006), the Canadian public has little understanding of how the social determinants of health (including adequate housing) affect health. Health care workers and hospital administrators see

firsthand the negative effects of social inequities on the lives of patients. Their involvement in advocating for change can be the impetus needed to bring these issues to the forefront and create the political will to fully address these issues.

Implications for Research

Due to the importance of housing on health, questions regarding housing should be a part of admission and discharge planning for all patients (Booth, 2011). It is difficult to know how many patients are admitted to acute care settings from shelters and homelessness and subsequently discharged back to shelters or to homelessness as there is little data on the frequency of this occurrence. Patients may also lose housing as a result of a hospital admission, or loss of work related to injuries and illness (Best & Young, 2009). This may lead to a discharge to homelessness with the subsequent risks of complications and re-admission. Large, multi-site studies are needed to bring about recognition of this phenomenon and describe the population at risk.

Prospective studies which compare lengths of stay for housed and homeless patients would add strength to the findings in this study. Comparison of lengths of stay for different diagnostic groups would also add to the knowledge on hospitalization and homelessness. The addition of a qualitative component would help in the understanding of the perspective of people who are homeless. It would provide information on what individuals who are homeless identify as their needs during discharge planning and for effective follow-up care. The homeless population is a diverse group and because of this more research is needed to determine which interventions work best with different groups. The “At Home/Chez Soi” project reports that they have not been successful in establishing permanent housing for all their participants but with continued research they

are developing a better understanding of the needs of those that are hard to house (Goering et al., 2014). Similar types of research are needed to determine the best discharge planning initiatives which take into consideration the complex needs of the patient who is homeless and the types of community resources available and the supports that that are required such as services for mental health, addiction or chronic disease management (Backer, Howard, & Moran, 2007; Pauly, 2008). Involving patients who are homeless in the planning process is essential. Discharge planning needs to consider the unique needs of sub-populations of homeless such as youth, women, families and First Nations.

There is extensive research on homelessness and healthcare. This information can be used in the development of interventions to prevent discharges to homelessness and to provide improved health outcomes for patients who are homeless. Research needs to address ways in which existing knowledge can be disseminated and translated into practice.

Conclusion

Findings from this study demonstrate the poorer health outcomes for orthopedic patients who are homeless and add to the literature on the effects of homelessness on health. They underline the need for improved care and supports following discharge for individuals affected by homelessness. Research has demonstrated that improved outcomes and health care cost savings can be achieved through supportive discharge environments and integrated community services. It is only through the combined efforts of health care professionals, social services agencies, policy makers and governments of all levels that this knowledge can be used to address the issues affecting the health of

those who are homeless. Research, education, advocacy and policies are all needed to increase knowledge and affect the changes in attitudes and the allocation of resources needed to address homelessness in Canada. Addressing homelessness will lead to better health for those affected by homelessness and reduced costs to governments and taxpayers.

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Appendix B: Data Collection Form: Electronic Patient Record."

University Logo

Hospital Logo

Data Collection Form – Subject Code _____

To be used for Electronic Patient Record Only**Obtain from face page of Electronic Patient Record**

Admission Date: ____/____/____ (year/month/day)

Discharge Date: ____/____/____ (year/month/day)

Length of stay: ____ (date of discharge minus date of admission – round up to a whole number)

Age: ____ (in Years)

Sex: __Male __Female

Obtain from Personal Information Section

Home Address given: ____ Home ____ Shelter ____ No fixed address

Obtain from Clinical Documents Section

Admission Diagnosis:

Was this the first admission for this diagnosis? ____ Yes ____ No

If no, when was the primary injury? ____/____/____ (year/month/day)

Mechanism of Injury: (ie: fall, motor vehicle accident)

Obtain from Operative Reports Section

Surgical Procedure(s):

Was there a previous surgery for this diagnosis? Yes No

If yes: Surgical Procedure

Date of above procedure: ____/____/____ (year/month/day)

Medical History: (check any that are documented in chart)

<input type="checkbox"/> Coronary artery disease (CAD)	<input type="checkbox"/> Peripheral Vascular Disease
<input type="checkbox"/> Diabetes Type I <input type="checkbox"/> Diabetes Type II	<input type="checkbox"/> Cancer (indicate type) _____ _____
<input type="checkbox"/> Chronic Obstructive Lung Disease	<input type="checkbox"/> Gastrointestinal illness (ie: Crohns, diverticulitis, GERD)
<input type="checkbox"/> Emphysema	<input type="checkbox"/> Mental Illness
<input type="checkbox"/> Stoke	<input type="checkbox"/> Drug dependence
<input type="checkbox"/> Transient Ischemic Attacks (TIAs)	<input type="checkbox"/> Alcohol dependence
<input type="checkbox"/> Arthritis	

<input type="checkbox"/> Osteoporosis	

Indications of Infection: Obtained from Medications Section

Was the patient prescribed antibiotics (other than immediately prior to OR). Yes No

Date started: ____/____/____ (year/month/day)

Date completed: ____/____/____ (year/month/day)

Type of antibiotic: oral intravenous

Were antibiotics prescribed on discharge: Yes No

Type of antibiotic on discharge: oral intravenous

Was there documentation during admission of concern for a wound infection (reddened, non-healing, purulent drainage)? Yes No

Obtained from Powerchart

Laboratory indicators of infection during hospital stay:

White blood cell count: _____ IU (normal value; 4.3 – 10.8)

ESR ____ (mm/hr) (normal value 12- 23)

CRP ____ (mg/L (normal value < 10 mg/L)

Clinical indications of infection: (May not be found in the Electronic Patient Record)

Fever: Yes No

If Yes: Temperature ____

Wound reddened: ___ Yes ___ No

Purulent drainage: ___ Yes ___ No

Found in Clinical Documents – Outpatient visits

Was there documentation during a follow up visit of concern for a wound infection (reddened, non-healing, purulent drainage)? ___ Yes ___ No

Were antibiotics prescribed on a clinic visit? ___ Yes ___ No

Date started: ___/___/___ (year/month/day)

Date completed: ___/___/___ (year/month/day)

Laboratory indicators of infection during follow up visit:

White blood cell count: _____ IU (normal value; 4.3 – 10.8)

ESR ___ (mm/hr) (normal value 12- 23)

CRP ___(mg/L (normal value < 10 mg/L)

Clinical indications of infection:

Fever: ___ Yes ___ No

If Yes: Temperature ___

Wound reddened: ___ Yes ___ No

Purulent drainage: ___ Yes ___ No

Found in Appointments - Follow up visits

Was a follow up visit given on discharge: ___ Yes ___ No

Did patient initial attend follow up visit: ___ Yes ___ No

How many follow up visits were documented for this diagnosis? _____

How many were missed? _____

Was patient re-admitted from clinic for a condition related to this diagnosis (ie: infection, failure to heal, fixation failure): ___ Yes ___ No

If Yes Date: ____/____/____ (year/month/day)

Reason:

Found in Patient Visits

Was patient seen in the emergency department for a condition related to this diagnosis?

___ Yes ___ No

If yes: Date: ____/____/____ (year/month/day)

Reason for visit:

Was patient readmitted from the emergency department for a condition related to this diagnosis (ie: infection, failure to heal, fixation failure): ___ Yes ___ No

If Yes Date: ____/____/____ (year/month/day)

Reason:

Chart Reviewed by:

Date of chart review: ____/____/____ (year/month/day)

Appendix C: Data Collection Form: Paper Chart.

University Logo

Hospital Logo

Data Collection Form – Subject Code _____

To be used for Paper Copy of Chart Only**Obtain from face page**

Admission Date: ____/____/____ (year/month/day)

Discharge Date: ____/____/____ (year/month/day)

Length of stay: ____ (date of discharge minus date of admission – round up to a whole number)

Age: ____ (in Years)

Sex: __Male __Female

Home Address given: ____ Home ____ Shelter ____ No fixed address

Obtain from Clinical Documents Section or Consult SectionAdmission Diagnosis:

Was this the first admission for this diagnosis? ____ Yes ____ No

If no, when was the primary injury? ____/____/____ (year/month/day)

Mechanism of Injury: (ie: fall, motor vehicle accident)

_____**Obtain from Operative Reports Section**

Surgical Procedure(s):

Was there a previous surgery for this diagnosis? ___ Yes ___ No

If yes: Surgical Procedure

Date of above procedure: ___/___/___ (year/month/day)

Obtain from Clinical Records and/or Consult section

Medical History: (check any that are documented in chart)

___ Coronary artery disease (CAD)	___ Peripheral Vascular Disease
___ Diabetes Type I ___ Diabetes Type II	___ Cancer (indicate type) _____ _____
___ Chronic Obstructive Lung Disease	___ Gastrointestinal illness (ie: Crohns, diverticulitis, GERD)
___ Emphysema	___ Mental Illness
___ Stoke	___ Drug dependence
___ Transient Ischemic Attacks (TIAs)	___ Alcohol dependence

<input type="checkbox"/> Arthritis	
<input type="checkbox"/> Osteoporosis	

Indications of Infection:

Obtained from Physician Order Section

Was the patient prescribed antibiotics (other than immediately prior to OR). Yes No

Date started: ____/____/____ (year/month/day)

Date completed: ____/____/____ (year/month/day)

Type of antibiotic: oral intravenous

Were antibiotics prescribed on discharge: Yes No

Type of antibiotic on discharge: oral intravenous

Was there documentation during admission of concern for a wound infection (reddened, non-healing, purulent drainage)? Yes No

May not be in paper copy of chart

Laboratory indicators of infection during hospital stay:

White blood cell count: _____ IU (normal value; 4.3 – 10.8)

ESR ____ (mm/hr) (normal value 12- 23)

CRP ____ (mg/L (normal value < 10 mg/L)

Obtain from Clinical Notes**Clinical indications of infection:**

Fever: ___ Yes ___ No

If Yes: Temperature ___

Wound reddened: ___ Yes ___ No

Purulent drainage: ___ Yes ___ No

May not be in Paper Chart

Was there documentation during a follow up visit of concern for a wound infection (reddened, non-healing, purulent drainage)? ___ Yes ___ No

Were antibiotics prescribed on a clinic visit? ___ Yes ___ No

Date started: ___/___/___ (year/month/day)

Date completed: ___/___/___ (year/month/day)

Laboratory indicators of infection during follow up visit:

White blood cell count: _____ IU (normal value; 4.3 – 10.8)

ESR ___ (mm/hr) (normal value 12- 23)

CRP ___(mg/L (normal value < 10 mg/L)

Clinical indications of infection:

Fever: ___ Yes ___ No

If Yes: Temperature ___

Wound reddened: ___ Yes ___ No

Purulent drainage: ___ Yes ___ No

Found in Physician's Order section

Follow up visits

Was a follow up visit given on discharge: ___ Yes ___ No

May not be in Paper chart

Did patient initial attend follow up visit: ___ Yes ___ No

How many follow up visits were documented for this diagnosis? _____

How many were missed? _____

Was patient re-admitted from clinic for a condition related to this diagnosis (ie: infection, failure to heal, fixation failure): ___ Yes ___ No

If Yes Date: ____/____/____ (year/month/day)

Reason:

Found in Patient Visits

Was patient seen in the emergency department for a condition related to this diagnosis?

___ Yes ___ No

If yes: Date: ____/____/____ (year/month/day)

Reason for visit:

Was patient readmitted from the emergency department for a condition related to this diagnosis (ie: infection, failure to heal, fixation failure): ___ Yes ___ No

If Yes Date: ___/___/___ (year/month/day)

Reason:

Chart Reviewed by:

Date of chart review: ___/___/___ (year/month/day)

Appendix D: Ethics Approval.



Research Ethics

Use of Human Participants - Ethics Approval Notice

Principal Investigator: Dr. Cheryl Forchuk
File Number: 103919
Review Level: Delegated
Approved Local Adult Participants: 0
Approved Local Minor Participants: 0
Protocol Title: Comparison of Homeless and Housed Orthopedic Patients: A Retrospective Study
Department & Institution: Health Sciences/Nursing, Western University
Sponsor:
Ethics Approval Date: July 05, 2013 **Expiry Date:** June 30, 2014
Documents Reviewed & Approved & Documents Received for Information:

Document Name	Comments	Version Date
Other	References	
Western University Protocol		2013/05/29
Response to Board Recommendations		2013/06/27
Amendment	Revised Data Collection Form Appendix E	2013/06/26
Amendment	Revised Data Collection Form Appendix D	2013/06/26

This is to notify you that The University of Western Ontario Research Ethics Board for Health Sciences Research Involving Human Subjects (HSREB) which is organized and operates according to the Tri-Council Policy Statement: Ethical Conduct of Research Involving Humans and the Health Canada/CH Good Clinical Practice Practices: Consolidated Guidelines; and the applicable laws and regulations of Ontario has reviewed and granted approval to the above referenced revision(s) or amendment(s) on the approval date noted above. The membership of this REB also complies with the membership requirements for REB's as defined in Division 5 of the Food and Drug Regulations.

The ethics approval for this study shall remain valid until the expiry date noted above assuming timely and acceptable responses to the HSREB's periodic requests for surveillance and monitoring information. If you require an updated approval notice prior to that time you must request it using the University of Western Ontario Updated Approval Request Form.

Members of the HSREB who are named as investigators in research studies, or declare a conflict of interest, do not participate in discussion related to, nor vote on, such studies when they are presented to the HSREB.

The Chair of the HSREB is Dr. Joseph Gilbert. The HSREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000940.


 Signature

Ethics Officer to Contact for Further Information

<input type="checkbox"/> Erika Basile (ebasile@uwo.ca)	<input checked="" type="checkbox"/> Grace Kelly (grace.kelly@uwo.ca)	<input type="checkbox"/> Vikki Tran (vikki.tran@uwo.ca)	<input type="checkbox"/> Shantel Walcott (swalcot@uwo.ca)
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This is an official document. Please retain the original in your files.

Western University, Research, Support Services Bldg., Ste. 5150
 London, ON, Canada N6A 3K7 t: 519.661.3036 f: 519.850.2466 www.uwo.ca/research/services/ethics

LAWSON FINAL APPROVAL NOTICE

RESEARCH OFFICE REVIEW NO.: R-13-290

PROJECT TITLE: Comparison of Homeless and Housed
Orthopedic Patients: A Retrospective Study

PRINCIPAL INVESTIGATOR: Dr. Cheryl Forchuk

LAWSON APPROVAL DATE: July 9, 2013

Health Sciences REB#: 103919

Please be advised that the above project was reviewed by the Clinical Research Impact
Committee and the project:

Was Approved

**Please inform the appropriate nursing units, laboratories, etc.
before starting this protocol. The research office review number
must be used when communicating with these areas.**

Dr. David Hill

V.P. Research

Lawson Health Research Institute

All future correspondence concerning this study should include the Research Office Review Number and should be directed to Sherry
Paiva, CRIC Liaison, Lawson Health Research Institute, 750 Baseline Road, East, Suite 300.

cc: Administration

Curriculum Vitae

Name: Susan Williams

Post Secondary Education

University of Western Ontario
 Masters of Science in Nursing (candidate)
 Post R.N. BScN, June 1994

Fanshawe College
 Registered Nursing Diploma, 1976

Canadian Nurses Association
 #95050104
 Certified Nurse in Critical Care March 1995 – April 2014

Professional Development

Crucial Conversations, 2008
 Introductory and Advanced Excel Workshop, 2008
 GE Essentials of Leadership Excellence, 2006
 Holistic Approach to Positive Wound Outcomes in Wound Management, 2005
 Critical Appraisal Course for Nurses, 2003
 Resource Person for New Computer Training, CCTC, 1998-1999
 Coordinated Infusion Pump Trial in CCTC, 1998
 ACLS 1995, 2009
 Development of Critical Care Extended Role Transport Manual, 1994-1995
 Leadership Seminar, Career Track, 1991
 BCLS Instructor 1988 - 1990
 Nursing Management (Canadian Hospital Association/Canadian Nurses' Association),
 1987
 Twelve Lead ECG Course, Fanshawe College, 1984

Honours and Awards

Post R.N. BScN, June 1994
 Dean's Honour List
 Harvey F. Sullivan Scholarship 2012

Employment History

London Health Sciences Centre	1976 -Present
Including Westminster and Victoria Hospitals	
Nurse Clinician Ortho/Trauma	2009 -present
Clinical Educator General Surgery, MOTS	2008 -2009
Manager CCTC	2006 -2008

Staff Nurse CCTC	2005 -2006
Clinical Resource/Charge Nurse, CCTC	2003 -2005
RPT Staff Nurse, CCTC	1991- 2003
Temporary Educator, CCTC	1998 -1999
Full Time Charge Nurse, CCTC	1985 -1991
Temporary Charge Nurse Teacher, CCTC	1988 -1989
Full Time Staff Nurse, CCTC	1982 -1985
Full Time Staff Nurse, 3 Centre (General Surgery)	1977 -1981
Full time Staff Nurse, G-Lower (Geriatrics)	1976 -1977

Related Employment History

Fanshawe College	1995-2001
Relief Clinical Instructor (Nursing)	1995-1998
Developed and Taught “Introduction to Cardiology”	1999-2001

Research and Presentations

Recognition, Treatment and Prevention of Delirium Modules for Surgical Services at London Health Sciences Centre 2012

“*Medline Searching for the Beginning Searcher*” co-presented with Melanie Chittendon at Dynamics 2002

Research Group:

“*Development of a Clinical Practice Guideline for Backrest Positioning*”

Morgan, B.L., Burling, A., Chittenden, M., Geroux, D., Morley, D., Reddick, S., Stewart, P., Spina, C., Taylor, J., Tetlock, N., and Williams, S., 2000-2001

Presented as an Oral Poster at Dynamics 2001

Developed and taught “Introduction to Cardiology” Course, 1999

Professional Memberships

College of Nurses of Ontario

7707482

Registered Nurses’ Association of Ontario

Member #770748

Bone and Joint Health Network