Comparison of Homeless and Homed Orthopedic Patients: A Retrospective Study

Susan M. C. Williams

University of Western Ontario
N9662

Dr. Carol Wong

April 12, 2013

Abstract

The social determinants of health are recognized as having a significant impact on the health of populations. Lower socioeconomic status has been associated with poorer levels of health than for those in higher socioeconomic groups. The homelessness population is a diverse group which represents those at the very end of the socioeconomic scale. They are more likely to suffer from chronic conditions, addictions, and mental health issues. Trauma and exposure to the elements makes them prone to orthopedic injuries. Studies on homelessness have shown that they are admitted to hospital more frequently, for longer periods of time and at a younger age than housed patients. Once admitted to hospital, discharge planning is difficult and resource intensive, often leading to discharge to the streets or a shelter. This puts them at risk for complications and readmission. This 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.

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

Background and Significance

The homeless are one of the most disadvantaged and marginalized groups in society. Their numbers are growing in Canada as the result of changes in social programs and political policies (Bryant, 2004; Forchuk, Schofield, Joplin, Csiernik, Gorlick, & Turner, 2011). They are a divergent group with complex needs requiring cooperation and partnerships among social programs in order to assist them (Berman, Gorlick, Csiernik, Ray, Forchuk, Jensen, & Al-Zoubi, 2011). Current research shows that families are the fastest growing group among the homeless (Hulchanski & Shapcott, 2004).

Homelessness causes stress and social exclusion, which contributes to illness and disease (Bryant, 2004). 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, Hanks, Stevens, & Geroso, 2005; Hwang, 2004); are frequently exposed to tuberculosis and HIV; and are more likely to experience violence (Forchuk, MacClure, Van Beers, Smith, Csiernik, Hoch, & Jensen, 2008; Hwang, 2001; Raven, Carrier, Lee, Billings, Marr, & Gourevitch, 2010). Many suffer from mental health illness and have substance abuse problems (Hwang, 2001; Raven, et al., 2010). Disease severity is often greater because of delays in seeking health care, inability to adhere to treatment regimes, cognitive impairments, and the effects of homelessness (Hwang, 2004).

The homeless present unique challenges to the health care system. Primary care may be inconsistent or completely lacking, leading to increase use of emergency departments for health care. Once admitted to hospital, 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 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 and an increased risk of complications and readmission to acute care (Tsilimingras & Westfall Bates, 2008). 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 the homeless appeared in the literature (Okin et al., 2000; Best & Young, 2009; Fader & Phillips, 2012). There are no studies specific to the orthopedic population.

Trauma and musculo-skeletal injuries are common among the homeless, yet little is known about the specific effects of these injuries on the homeless. 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 the 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 are rooted in political, economic, social and environmental aspects of our daily lives and impact health, disease, and disease severity (WHO, 1986; Raphael & Bryant, 2006). They 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 due to the social determinants of health and often fail to reach those most affected by them (Starfield et al.,

2012). 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 - for it was these conditions that caused (and continued to affect) their ill health (Falk-Rafael, 2005). Nursing today focuses more on health-care accessibility and health behaviours which are considered proximal causes of disease and fail 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). Falk-Rafael (2005) states that it is critical to the future of the profession that nurses "fulfill its social mandate" (Falk-Rafael, 2005, p 222). Reutter & 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.

In order for nurses to advocate for the orthopedic homeless population, information is needed about their hospital admissions and factors that impact their health. Recognizing the differences in patient outcomes will allow for the development of interventions to address inequities and improve the care and outcomes of this vulnerable population. A secondary benefit of these interventions would be a decrease in emergency room visits, admissions and length of stay which can assist in decreasing the demands being placed on our health care system.

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, 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 incidences of infection and attendance at follow up appointments in the orthopedic population?

Review of the Literature

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 the following ways: it affects many diseases and health conditions; it affects disease outcomes through multiple risk factors, which can change through time; and it 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. In addition, 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 Social determinants of health include social, demographic, economic and behavioural factors which interact to influence the health of individuals, communities and populations (Link & Phelan, 1995). Prus (2011) adapted a framework from House (2002)

linking the social determinants of health to health outcome. This model (see Appendix A) 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, such as sex, race, age, country of birth, 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, decreasing attendance at follow up and increasing length of hospital stay for those at the lowest end of the socioeconomic scale, the homeless. (see Appendix B)

In this study the independent variable, housing status, will be categorized as either housed or homeless. There is no consensus on the definition of homelessness (Tsai, Weintraub, Gee, & Kushel, 2005; Forchuk, Csiernik & Jansen, 2010; Forchuk, McKane, Molineeux, Schofield, & Csiernik,2011). Definitions vary from those that are on the streets without any type of housing, "rooflessness", those living in shelters, "houselessness", those living with friends or relatives, in violent situations or in other insecure situations, "housing insecurity" and those living in housing which is unsafe or inadequate for the number of people living there, "inadequately housed" (Lauder, Kroll, & Jones, 2007). 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 roofless and houseless groups defined by Lauder,et al., (2007).

The outcome or dependent variables will be length of stay (LOS) defined as the number of days in hospital, the presence or absence of infection, and attendance at follow up. Lack of adequate follow up care and treatment can increase the risk of adverse events (Tsilimingras & Westfall Bates, 2008) such as infection.

Housing as a social determinant of health, 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 no data on the frequency of this occurrence. Research is needed to bring about recognition of this phenomenon and describe the population at risk. This information can then be used in the development of interventions to prevent it from continuing and improve health outcomes in homeless patients.

Social Determinants of Health and Homelessness and Length of Stay

In 2008 the World Health Organization called for global action on the social determinants of health (SDOH), recognizing that health inequities related to the unequal distribution of power, income, goods, and services - both globally and within nations - contribute to poor health (Marmot, Friel, Bell, Houweling, & Taylor 2008). Canada is recognized as a leader in the theoretical discussion 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 supported by neo-liberalism

(Raphael, 2003; Raphael & Bryant, 2006; Navarro, 2009). Research using the SDOH is needed to provide support for the model and inform policy development. .

The Joint Canada/United States Survey of Health (JCUSH) uses education, employment and income as measures of socioeconomic status (SES). Prus (2001) used data from this study to compare the effects of the social determinants of health on the health of Canadians and Americans. He 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. 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.

A comparison of hospital costs and length of stay (LOS) in homeless, low SES, and high SES patients found that homeless patients had higher rates of hospital admission, longer lengths of stay, and more emergency department admissions compared with the other two groups (Nosyk, Li, Sun & Anis, 2007). In 2011, Hwang, Weaver, Aubry & Hoch (2011) reviewed total hospital costs for homeless and housed patients in Toronto, Canada. Homeless patients had higher costs and longer LOS for medical, surgical and psychiatric services. In medical and surgical patients, the increased costs were due to LOS and alternate level of care (ALC) days (Hwang et al, 2011). Patients are labeled ALC when they are stable for discharge but there is no safe discharge destination for them. This supports previous research on homeless patients which indicates that a lack of a safe discharge destination leads to increases in LOS and hospital costs. Hwang

et al. suggest that the use of use of respite for medical and surgical patients could decrease costs.

The SDOH have also been used to assess the health effects of groups other than the homeless. The Coasts under Stress project looked at the impact of the social determinants on women's health in the coastal communities of Newfoundland and Labrador (Solberg, 2006). Solberg states that using the SDOH model led to an interdisciplinary approach providing a deeper understanding of the issues facing women in these communities and research which can inform policy-makers of the impact political policies have on the lives of people. Dysart-Gale (2010) looked at how the SDOH affected lesbian, gay, bisexual, transgendered, intersexed and queer (LGBTIQ) youth in Canada and found that marginalization of these youth resulted in disrupted education, homelessness, violence and mental health disorders.

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 in research studies have been defined by; the presence of purulent drainage or osteomyelitis (Butterworth, Gilheany, & Tinley 2007; Motsitsi, 2008; Harley, Beaupre, Jones, Dulai & Weber, 2002); 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., 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.

Open fractures of the tibial shaft most common long bone injury and a systematic literature review done by Papakostidis, Kanakaris, Pretel, Faour, Morell & Giannoudis (2011) found a strong association between the severity of the open fracture and the risk of infections. Harley, et al., (2002) studied the time to definitive fixation on infection rates and found no differences in infection rates for open orthopedic injuries which 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 fractures developed infections. Bhandari, Zlowodzki, Tornetta, Schmidt & 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.

No studies were found on orthopedic injuries in the homeless population.

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 abuse (Hwang, 2001; Riley,et al., 2003; Adams, Rosenheck, Gee, & Seibyl, 2007) which leads to higher hospitalization rates, prolonged length of stays, and increased mortality (Kushel, Vittinghoff, & Haas, 2001; Hwang, 2001). Homeless patients discharged from hospital are frequently unable to comply with treatment regimes and follow-up due to lack of resources and social support. Tsilimingras & Westfall Bates (2008) found that non-compliance with treatment after discharge led to adverse events and readmission. Although the homeless are prone to orthopedic injuries (Hwang, 2001), there is little research on the outcomes of the homeless orthopedic patient. An understanding of the

impact homelessness has on the outcomes of orthopedic patients is needed to in order to develop interventions which can improve health outcomes for these individuals.

Hypotheses

Homeless orthopedic patients experience longer hospital lengths of stay, higher infection rates, and lower rates of attendance at follow-up appointments than orthopedic patients that 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 complete courses 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 poor health.

Methodology

Study Design

This will be a non-experimental, retrospective, case control study which examines orthopedic patients who are homeless compared to those who are housed in relation to hospital length of stay, infection rates, and attendance at follow-up appointments. Gearing, Mian, Barber & Ickowicz (2006) developed methodological guidelines for conducting chart reviews as they recognized that this type of research can provide rich easily accessible data, allow the study of conditions that are rare or have long latency

between exposure and disease and lead to new hypotheses for testing prospectively. This research is a health services outcomes study to assess how outcomes differ for the homeless and housed orthopedic population, which is an unexplored area. This study will serve as a possible starting point to develop other research questions and hypotheses. Retrospective studies can also help in identifying the feasibility of a research question for a prospective study (Hess, 2004). Research based on mental health patients show that homeless patients have longer lengths of stay and poorer outcomes than housed patients but little research has been done on homeless patients in acute care and none on homeless orthopedic patients. Information from this study can be used to improve the discharge planning process for homeless patients within a Southwestern Ontario teaching hospital. Case control studies have the advantage of being less costly and can be done in shorter time frames, which is important in being able to address issues in health care inequities sooner for this study population.

Setting

This research will take place at a tertiary care, academic teaching hospital within a medium sized city in Southwestern Ontario. The hospital has two sites, one which specializes in lower limb injuries and trauma is situated close to the downtown area where the city's homeless shelters are located. Data will be obtained from this site as it is more likely to admit homeless patients. Obtaining the sample of homeless and housed patients from one site will decrease confounding factors such as differences in treatment patterns between hospital sites.

Sample

The target population will be all orthopedic patients admitted to a tertiary care, academic teaching hospital in South Western Ontario. All patients aged 18 to 75, admitted with an orthopedic diagnosis between April 1, 2008 and March 31, 2013, will be eligible for inclusion in the study. Exclusion criteria will be admissions of 24 hours or less, death while in hospital or patients who signed themselves out against medical advice. Homeless patients will be identified as those with no fixed address or giving the address of one of London's homeless shelters. Housed patients are those with an address other than no fixed address or a homeless shelter.

A convenience sample of patients will be identified from the hospital data base by diagnosis. A preliminary review of the hospital orthopedic database done over a two year period identified 33 homeless patients therefore the time frame of the chart review was extended to 5 years. A consecutive sample will be drawn from the list of identified, eligible homeless patients. Worster and Haines (2004) state that consecutive sampling is common and acceptable provided that the time period of selection is sufficient to include seasonal variations or other relevant changes over time. Housed patients will then be matched for diagnosis, age and sex.

A power analysis was conducted using G*Power 3.1 to calculate the appropriate sample size for this study statistically (see Appendix C). Using 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, the calculation revealed 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, I was unable to determine the effect size used by other researchers for similar studies. It is important to calculate sample size for a retrospective study by using statistics

(Worster & Haines, 2004) as this decreases the risk of having an underpowered study due to an inadequate sample size (Albert & O'Connor, 2012). Consideration should be given to drop outs, which in a retrospective study, is data that is missing in the chart (Gearing et al., 2006). Haber (2010) suggests adding 15 % extra subjects to the sample size in order to ensure the ability to detect differences between groups. This adds 8 participants for a total of 59 subjects for each group.

Operational Definition of Variables

As mentioned, homeless patients will be identified through the hospital data base as those having no fixed address or giving the address of a shelter as their home address. Difficulty in identifying patients as homeless can arise because they will often give the address of a friend or relative rather than admit to homelessness. Housed patients, those with an address other than a shelter or no fixed address, will then be matched to the homeless patients for the demographics of age, sex and diagnosis.

Length of stay will be calculated as the discharge date minus the admission date and rounded up to the nearest whole number. Data on the target length of stay for each diagnostic category as defined by the Canadian Institute for Hospital Information will be obtained and compared to the length of stay for each patient. Marks Taylor, Burrows, Qayad & Miller (2000) compared lengths of stay for homeless tuberculosis patients with other tuberculosis patients and found that they were hospitalized more frequently and for longer periods of time.

Follow up appointments will be assessed using the "appointments" section of the electronic patient record which also provides information on whether the appointment was attended or not. The physical chart will also be reviewed to determine if there is

information regarding follow up appointments in the doctor's order section, in the discharge information sheet and/or in the nursing notes.

Information on infections will be obtained from laboratory data in the electronic patient record. Data to be recorded includes the white blood count (wbc), erythrocyte sedimentation rate (ESR) and C-Reactive Protein (CRP) as an increase in these markers indicates inflammation which can signal infection. Vital sign sheets will be assessed for the incidence of fever. Notes from the hospital stay and from clinic visits will be examined to determine if notations were mad to indicate the presence of redness, swelling and drainage from wounds, fever and chills or other documentation of concerns for or existence of, a wound infection. Doctor's order sheets and clinic notes will be reviewed for the ordering of antibiotics. Absence of documentation of any of these indicators will be interpreted as no concerns for infection were present and therefore the patient did not have an infection.

Data Collection Procedure

Data collection will occur in accordance with the guidelines for patient chart review at the academic teaching hospital using both the electronic patient record and the paper chart. Separate data collection forms were created for the electronic patient record (see Appendix D) and for the paper chart (see Appendix E) as recommended by Worster & Hianes (2004). Data collection will be done primarily using the electronic patient record. The paper chart will be accessed only if data is not available in the electronic patient record. Development of the data collection forms was done using the recommendations for retrospective chart reviews (Gearing, et al., 2006). Data were arranged as closely as possible to the order it will be retrieved in the paper chart and in

the electronic patient record to ease data collection and minimize the risk of missing data to be collected.

Data collectors will be sought from the nurses employed by the hospital who are being accommodated for work restrictions. The hospital's policy on who can have access to charts will also determine who can be involved in data collection. Data collectors will be trained by the investigator using a set of protocols developed to describe how each variable is defined and measured, where it can be obtained in the patient record, and the protocols for accessing the patient record (Gearing et al., 2006). Regular meetings will be held with data collectors to resolve conflicts or to clarify points during the data collection process. Protocols and data collection criteria help to increase inter-rater reliability and decrease missing data (Gearing et al., 2006). Data collectors will be blinded to the study hypothesis. Inter-rater reliability will be tested and frequent data collection review will take place to ensure data quality and minimize missing data. Data will be entered from the data collection forms into Microsoft Excel.

Data Analysis Plan

Data will be analyzed using Statistical Software Package for the Social Sciences (SPSS) version 20. Demographic data will be collected on all subjects in order to compare the housed and homeless groups to detect any differences which may affect findings.

Descriptive statistics will be presented in order to provide an overview of all study variables. Frequency data will be collected for all variables and checked for data which are outside the normal range. The dependent variables, presence of infection and attendance at follow up, are both categorical data and for ease of reporting can be

displayed as bar graphs and percentages comparing the results for the housed and homeless groups. The mean, standard deviation, and median values for length of stay will be provided. Length of stay data will be assessed for normality by assessing for outliers, skewness and kurtosis. Assessment for normal distribution is a requirement of many statistical tests (Plichta & Kelvin, 2013).

The independent and dependent variables will be analyzed by demographic data to assess for differences related to demographics. Chi-square tests will be used to assess the dependent variables, incidence of infection and attendance at follow up, and the independent variable, housing status, with the demographic data, mechanism of injury, type of surgical procedure and sex. Chi-square is appropriate for use when both variables are nominal, there is adequate sample size so that none of the cells in the 2x2 table are empty and each of the measures are independent of each other (Plichta & Kelvin, 2013). Should any of these assumptions be violated then a Fisher's exact test or a McNemar test can be used (Plichta & Kelvin, 2013).

An independent t test will be used to test the dependent variables, incidence of infection and attendance at follow up, and the independent variable, housing status, with age and, the dependent variable, length of stay, with mechanism of injury, type of surgical procedure and sex. A t test is used to compare two groups when the grouping variable is dichotomous and mutually exclusive, the categories are independent of each other, and the variable of interest is normally distributed and continuous (Plichta & Kelvin, 2013). A Mann-Whitney U-test can be used if the assumptions of the t test are violated (Plichta & Kelvin, 2013).

A correlation test will be run for length of stay and age if the data meet the assumptions of either the Pearson correlation or a Spearman's correlation. A correlation test is used to assess the relationship between two variables. For a Pearson Correlation the two variables must be either interval or ratio scale, normally distributed, have a linear relationship and no outliers in the data. Plichta & Kelvin (2013) suggest that a Spearman's correlation can be used if the assumptions of the Pearson Correlation are violated but the direction of the association must be the same. Should these assumptions are violated; Plichta & Kelvin say a Kendall's Tau can be used.

To test the hypothesis, the housed and homeless group will be compared to the dependent variables presence of infection and attendance at follow up using chi square tests. Chi-square is appropriate for use when both variables are nominal, there is adequate sample size so that none of the cells in the 2x2 table are empty and each of the measures are independent of each other (Plichta & Kelvin, 2013). Should any of these assumptions be violated then a Fisher's exact test or a McNemar test can be used.

An independent t test will be used to test the difference between the housed and homeless groups and mean length of stay. A t test is used to compare two groups when the grouping variable is dichotomous and mutually exclusive and the categories are independent of each other and the variable of interest is normally distributed and continuous (Plichta & Kelvin, 2013). A Mann-Whitney U-test can be used if the assumptions of the t test are violated (Plichta & Kelvin, 2013). The level of significance for this study will be set at alpha equal to 0.05.

Although reliability of the data cannot be reported on in a retrospective study, the interrater reliability of data abstractors can be reported. This will be done by calculating a Cohen's kappa (Worster & Haines, 2004).

Missing data in a retrospective chart review can result in nonresponse bias (Worster & Haines, 2004). As recommended by Worster & Haines information missing in 10% or more of the cases will not be used in this study. Multiple imputations through SPSS will be used to manage missing data when less than 10% of the information is missing. Conflicting data will be resolved through consensus of the data abstractors. A report on missing and conflicting data will be included in the results section of the research report.

Ethical Considerations

Permission for this research study will be obtained from the Western University Health Sciences Ethics Review Board. Since this is a retrospective study using chart review it is eligible for Delegated level 1 review (Western University Ethics website). Approval will also be sought from the hospital's Ethics Review Board.

The Data collection form will have a subject code rather than patient identifiers on the form. The document linking the subject code with the patient's name, hospital number or other identifiers will be stored separately at a secure site. This document will be destroyed through confidential waste once the need for linkage of the subject code and patient is not longer needed as required by the Western University Ethics Review Board. Ethics approval will be published in the methods section of the research report as suggested by Gearing et al. (2006).

Limitations of the study

A weakness of this study is that it is a retrospective design so it may be difficult to match the homeless patient with a similar housed patient, and it is possible that other factors not apparent in the chart reviews account for any differences found between the two groups. Giuffre (1997) states that the most frequent threats to internal validity from a retrospective study are history and selection. Ensuring the groups in the study are as similar as possible to groups created through random assignment will help with the selection bias (Giuffre, 1997). According to Hess, (2004) the target population in chart reviews is usually not as well defined and there can be selection bias and confounding factors which can affect results. Attempts will be made to make groups as comparable as possible through matching diagnosis and demographic data. Research using a retrospective design is often used when it is unethical or impossible to randomly assign groups to the conditions under study (Giuffre, 1997) as is the case in this study. However, a prospective study may be done in future once a relationship between homelessness an orthopedic outcome is found. Notable limitations to chart review research include incomplete or missing documentations and poorly recorded or absent information (Giuffre, 1997; Gearling et al, 2006). The nine step process for conducting retrospective chart review research developed by Gearing et al, (2006) will be used in order minimize the limitations of this type of research.

Dissemination Plans

The results of this study will be written up as a research study and submitted to The Journal of Orthopedic Nursing. Presentation of this data will be made to orthopedic nurses through either an oral or poster presentation at the Canadian Orthopedic Nurses Association Conference. This data will also be presented to hospital administration,

social groups working with the homeless, including homeless shelters and to administration at the Southwestern Local Health Integration Network in order to gain support for interventions to assist the homeless leaving acute care.

References

Adams, J., Rosenheck, R., Gee, L., & Seibyl, C.L. (2007). Hospitalized younger: A comparison of a national sample of homeless and housed inpatient veterans. *Journal of Health Care for the Poor and Underserved*, 18(1), 173-184.

Albert, N.M. & O'Connor, P.C. (2012). How many subjects do I need in my research sample? *Clinical Nurse Specialist,* November/December, 302-304. Doi: 10.1097/NUR.0b013e31826fa91c

Berman, H., Gorlick, C., Csiernik, R., Ray, S.L., Forchuk,C., Jensen, E., & Al-Zoubi, F. (2011). The changing face of diversity in the context of homelessness. In Forchuk, C., Csiernik, R., & Jensen, E. (Eds), *Homelessness, Housing and Mental Health: Finding Truths – Creating Change* (pp. 205-228). Toronto: Canadian Scholars' Press.

Best, J. A. & Young, A. (2009). A SAFE DC: A conceptual framework for care of the homeless inpatient. Journal of Hospital Medicine, 4, 375-381.

Bhandari, M., Zlowodzki, M., Tornetta, P., & Schmidt, A. (2005). Intramedullary nailing following external fixation in femoral and tibial shaft fractures. Journal of Orthopedic Trauma, 19(2), 140-144.

Booth R. G. (2011). Using electronic patient records in mental health care to capture housing and homelessness information of mental health consumer-survivors. In Forchuk, C., Csiernik, R., & Jensen, E. (Eds.), *Homelessness, Housing and*

Mental Health: Finding Truths – Creating Change (pp. 191 – 104). Toronto: Canadian Scholars' Press.

Bryant, T. (2004). Housing as a social determinant of health. In Hulchanski, J.D., & Shapcott, M. (Eds.). *Finding Room: Policy Options for a Canadian Rental Housing Strategy* (pp. 159 – 166). Toronto: CUCS Press, Centre for Urban and Community Studies, University of Toronto.

Butterworh, P., Gilheany, M. F., & Tinley, P. (2010). Postoperative infection rates in foot and ankle surgery: A clinical audit of Australian podiatric surgeons, January to December 2007. *Australian Health Review*, 34, 180-185.

Dysart-Gale, D. (2010). Social justice and social determinants of health: Lesbian, gay, bisexual, transgendered, intersexed, and queer youth in Canada. *Journal of Child and Adolescent Psychiatric Nursing,* 23(1), 23-28.

Fader, H. & Phillips, C. (2012). Frequent-user patients: Reducing costs while making appropriate discharges., *Healthcare Management Financial* March, 98-106.

Falk-Rafael, A. (2005). Speaking truth to power: Nursing's legacy and moral imperative, *Advances in Nursing Science*, 28(3), 212-223.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical

power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*, 175-191.

Forchuk, C., MacClure, S.K., Van Beers, M., Smith, C., Csiernik, R., Hoch, J., & Jensen, E. (2008). Developing and testing an intervention to prevent homelessness among individuals discharged from psychiatric wards to shelters and "No fixed address". *Journal of Psychiatric and Mental Health Nursing*, 15, 569-575.

Forchuk, C., McKane, P., Molineeux, J., Schofield, R., & Csiernik, R. (2011).Glossary of Housing Terms. In Forchuk, C., Csiernik, R., & Jensen, E. (Eds.), *Homelessness, Housing and Mental Health: Finding Truths – Creating Change* (pp. 321 – 334). Toronto: Canadian Scholars' Press.

Forchuk, C., Schofield, R., Joplin, L., Csiernik, R., Gorlick, C., & Turner, K. (2011). Housing, Income Support and Mental Health: Points of Disconnection. In Forchuk, C., Csiernik, R., & Jensen, E. (Eds.), *Homelessness, Housing and Mental Health: Finding Truths – Creating Change* (pp. 35 – 47). Toronto: Canadian Scholars' Press.

Frankish, J., Veenstr, G & Moulton,G. (1999). Population Health in Canada: Issues and challenges for policy, practice and research. *Canadian Journal of Public Health*, 90, S71-S75.

Gearing, R. E., Mian, I. A., Barber, J. & Ickowicz. (2006). A methodology for conducting retrospective chart review research in child and adolescent psychiatary. *Journal of the Canadian Academy of Child and Adolescent Psychiatry*, 15(3), 126 – 134.

Giuffre, M. (1997). Designing research: Ex post facto designs. *Journal of Perianesthesia Nursing*, 12(3), 191-195.

Gundlapalli, A., Hanks, M., Stevens, S.M., & Geroso, A. M. (2005). It takes a Village: A multidisciplinary model for the acute illness aftercare of individuals experiencing homelessness. *Journal of Health Care for the Poor and Underserved*, 16(2), 257-272.

Haber, J. (2010). Sampling. In G. LoBiondo-Wood & J. Haber (Eds.), *Nursing Research: Methods and Critical Appraisal for Evidence-Based Practice* (pp220-245). New York, Mosby Elsevier.

Harley, B. J., Beaupre, L. A., Jones, C. A., Dulai, S. K., & Weber, D. W. (2002). The effect of time to definitive treatment on the rate of nonunion and infection in open fractures. *Journal of Orthopedic Trauma*, 16(7), 484-490.

Hess, D. (2004). Retrospective studies and chart reviews. *Respiratory Care,* 49(10), 1171 - 1174.

Hulchanski, J. D. & Shapcott, M. (2004). Introduction: Finding room in the housing system for all Canadians. In Hulchanski, J.D., & Shapcott, M. (Eds.*). Finding Room: Policy Options for a Canadian Rental Housing Strategy* (pp. 3-12). Toronto: CUCS Press, Centre for Urban and Community Studies, University of Toronto.

Hwang, S. W. (2001). Homelessness and Health. *Journal of the Canadian Medical Association*, 164(1), 229-233.

Hwang, S. W. (2004). Homelessness and Health. In Hulchanski, J.D., & Shapcott, M. (Eds.). *Finding Room: Policy Options for a Canadian Rental Housing Strategy*

(pp. 167-178). Toronto: CUCS Press, Centre for Urban and Community Studies, University of Toronto.

Hwang, S. W., Weaver, J., Aubry, T. & Hoch, J. S. (2011). Hospital Costs and Length of stay among homeless patients admitted to medical, surgical and psychiatric services. *Medical Care,* 49(4), 350-354.

IBM (2011). SPSS Statistics Version 20 Core System User's Guide, SPSS Inc.,Chicago,IL.

Kushel, M., Vittinghoff, E., & Haas, J. (2001). Factors associated with the health care utilization of homeless persons. *Journal of the American Medical Association*, 285(2), 200-206.

Larson, C. O. (2002). Use of the SF-12 instrument for measuring the health of homeless persons, *Health Services Research*. 37(3), p 733-750.

Lauder, w., Kroll, T., & Jones, M. (2007). Social determinants of mental health: The missing dimensions of mental health nursing? *Journal of Psychiatric and Mental Health Nursing,* 14, 661-669.

Link, B. G. & Phelan, J. (1995). Social conditions as fundamental causes of disease. *Journal of Health and Social Behavior,* Extra Issue, 80-94.

Marks, S., Taylor, Z., Burrows, N., Qayad, M. & Miller, B. (2000). Hospitalization of homeless persons with tuberculosis in the United States. *American Journal of Public Health,* 90(3), 435-438.

Marmot, M., Friel, S., Bell, R., Houweling, T. A.J. & Taylor, S. (2008). Closing the gap in a generation: Health equity through action on the social determinants of health. *The Lancet*, 372, 1661-1669.

Motsitsi, N. S. (2008). Management of infected nonunion of long bones: The last decade (1996-2006). *Injury, International Journal of the Care of the Injured,* 39, 155-160.

Navarro, V. (2009). What we mean by the social determinants of health. *Global Health Promotion*, 16(1), 5-16.

Nosyk, B., Li, X., Sun, H., & Anis, H. (2007). The effect of homelessness on hospitalization among patients with HIV?AIDS. *AIDS Care,*19(4), 546-553.

Okin, R., Boccellari, A., Azocar, F., Shumway, M., O'Brien, K., Gelb, A., Kohn, M., Harding, P., & Wachsmuth, C. (2000). The effects of clinical case management on hospital service use among ED frequent users. *American Journal of Emergency Medicine*, 18, 603-608.

Papakostidis, C., Kanakaris, N. K., Pretel, J., Faour, O., Morell, D. J., & Giannoudis, P. V. (2011). Prevalence of complications of open tibial shaft fractures stratified as per the Gustilo-Anderson classification. *Injury, International Journal of the Care of the Injured*, 42, 1408-1415.

Phelan, J, C., Link, B, G. & Tehranifar, P. (2010). Social conditions as fundamental causes of health inequalities: Theory, evidence, and policy implications. *Journal of Health and Social Behavior,* 51(S), S28-S40.

Plichta, S. B., & Kelvin, E. (2013). The Independent t Test and the Mann-Whitney U-Test: Measuring the Differences between the means of two unrelated groups. In S.B. Plichta & E. Kelvin (Eds.), Munro's Statistical Methods for Health Care Research, 6th ed. (pp.93-125). Wolters Kluwer, Philadelphia: Lippincott Williams & Wilkins.

Plichta, S. B., & Kelvin, E. (2013). Correlation Coefficients: Measuring the association of two variables. In S.B. Plichta & E. Kelvin (Eds.), Munro's Statistical Methods for Health Care Research, 6th ed. (pp. 263-288). Philadelphia: Wolters Kluwer, Lippincott Williams & Wilkins.

Plichta, S. B., & Kelvin, E. (2013) Examining Cross-Tabulations: The Chi-Square and associated statistics. In S.B. Plichta & E. Kelvin (Eds.), Munro's Statistical Methods for Health Care Research, 6th ed. (pp. 289-316). Philadelphia: Wolters Kluwer, Lippincott Williams & Wilkins.

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

Raphael, D. (2003). Barriers to addressing the societal determinants of health: Public health units and poverty in Ontario, Canada, *Health Promotion International*, 18(4), 397-405.

Raphael, D. & Bryant, T. (2006). The state's role in promoting population health : Public health concerns in Canada, USA, UK, and Sweden, *Health Policy*, 78, 39-55.

Raven, M.C., Carrier, E.R., Lee, J., Billings, J.C., Marr, M., & Gourevitch, M.N. (2010). Substance use treatment barriers for patients with frequent hospital admissions. *Journal of Substance Abuse Treatment*, 38, 22-30.

Reutter, L. & Kushner, K.E. (2010). "Health equity through action on the social determinats of health": Taking up the challenge in nursing. *Nursing Inquiry*, 17(3), 269-280.

Riley, A.J., Harding, G., Underwood, M.R. and Carter, Y.H. (2003). Homelessness: A problem for primary care? *British Journal of General Practice*, 53, 473-479.

Starfield, B., Gervas, J., & Mangin, D. (2012). Clinical care and health disparities. *The Annual Review of Public Health*, 33, 89-106.

Solberg, S. M. (2006). Researching the social determinants of women's health. *Canadian. Journal of Nursing Research*, 38(1), 169-174.

Tsai, M., Weintraub, R., Gee, L., & Kushel, M. (2005). Identifying homelessness at an urban public hospital: A moving target? *Journal of Health Care for the Poor and Underserved*, 16(2), 297-307.

Tsilimingras, D. & Westfall Bates, D. (2008). Addressing post discharge adverse events: A neglected area. *The Joint Commission Journal on Quality and Patient Safety*, 34(2), 85-97.

Western University Ethics website: http://www.uwo.ca/research/services/ethics/health_sciences_reb/submission_delegated.html#Requirements

World Health Organization, (1986) The Ottawa Charter for health promotion: The first international conference on health promotion. Retrieved from http://www.who.int/healthpromotion/conferences/previous/ottawa/en/print.html

Worster, A. & Haines, T. (2004) Advanced statistics: Understanding medical record review (MRR) studies. *Academy of Emergency Medicine*, 11(2), 187-192.

Appendix A

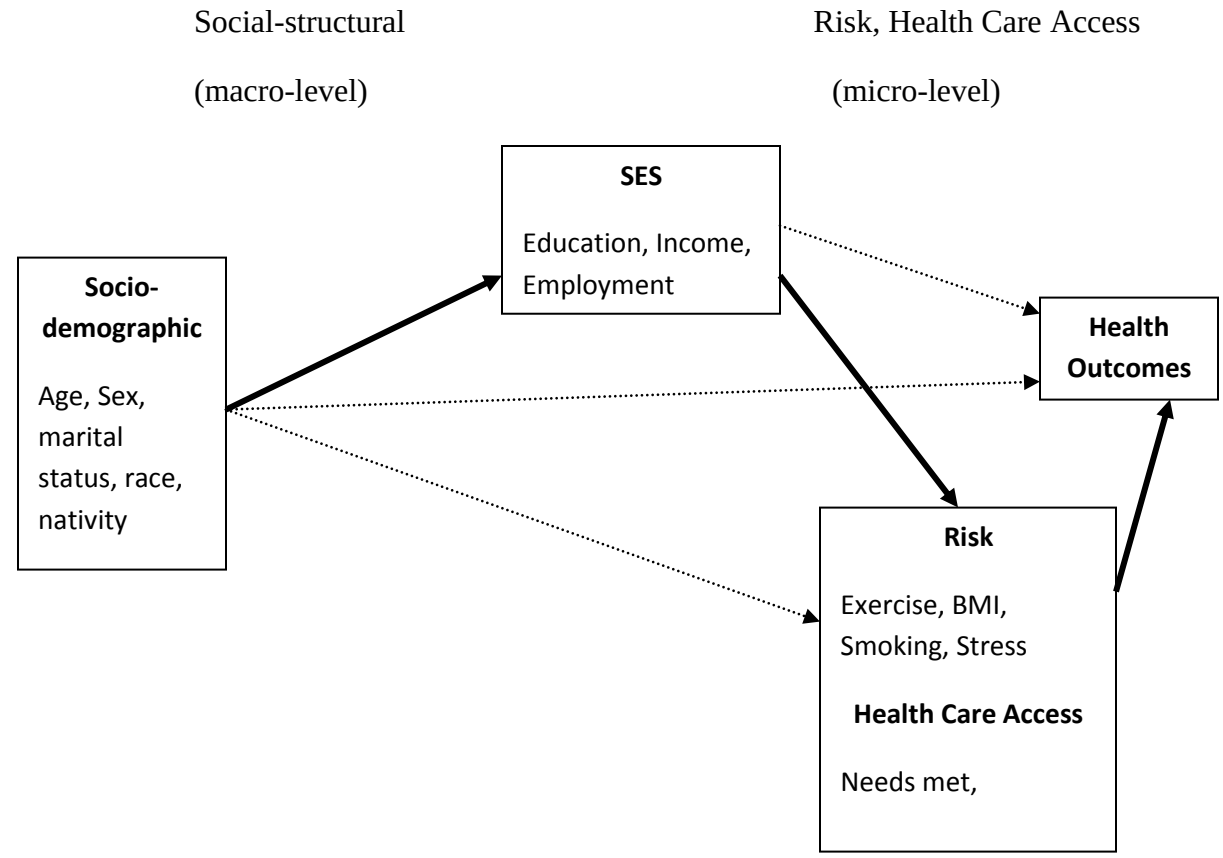

Fig 1 Conceptual framework for social determinants of health.

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

Appendix B

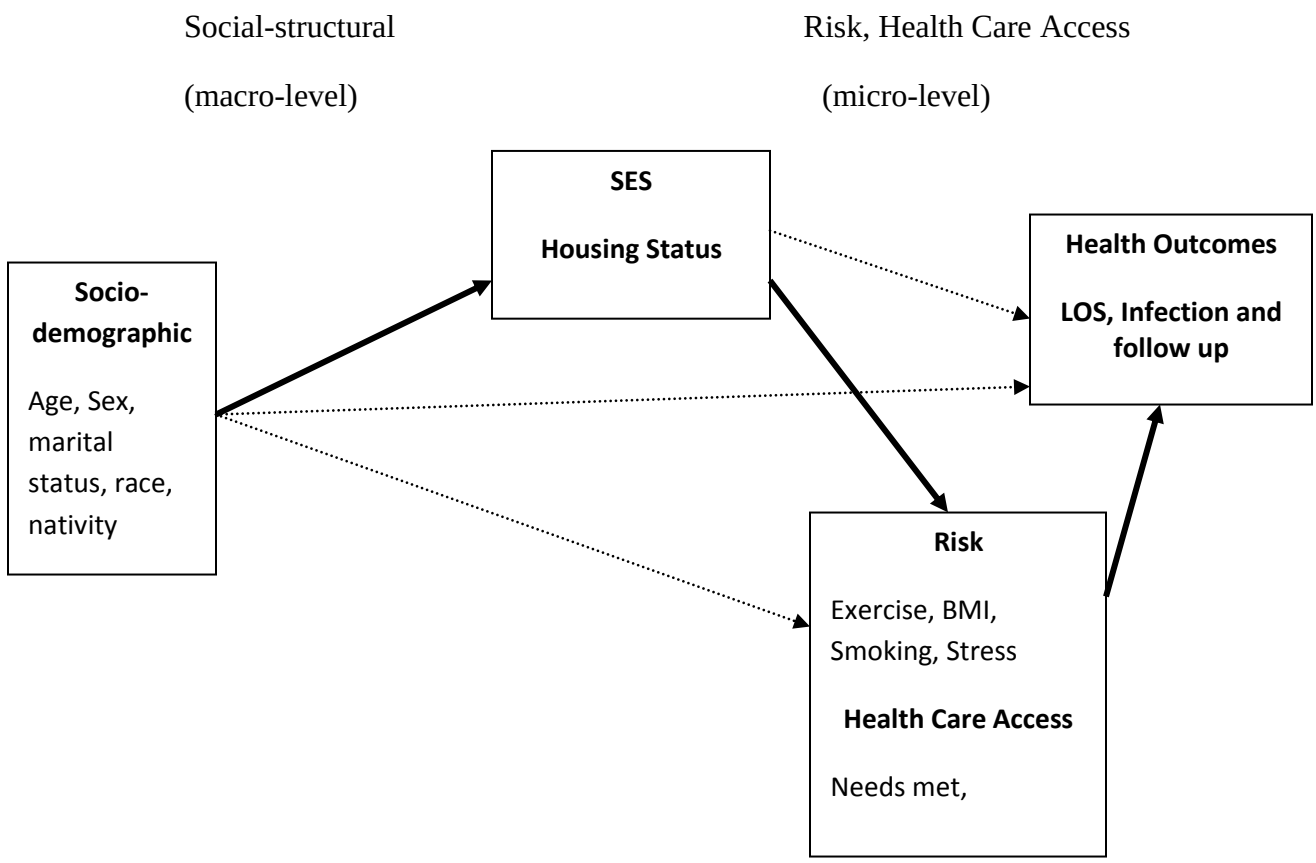

Fig 1 Conceptual framework for social determinants of health, housing status and health outcomes for orthopedic patients.

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.

Appendix C

t tests - Means: Difference between two independent means (two groups)

Analysis:	A priori: Compute required sample size		
Input:	Tail(s)	=	One
	Effect size d	=	0.5
	α err prob	=	0.05
	Power (1-β err prob)	=	0.80
	Allocation ratio N2/N1	=	1
Output:	Noncentrality parameter δ	=	2.5248762
	Critical t	=	1.6602343
	Df	=	100
	Sample size group 1	=	51
	Sample size group 2	=	51
	Total sample size	=	102
	Actual power	=	0.8058986

Sample size output from G*Power

Appendix D

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)

Date of Birth: ____/__/__ (year/month/day)

Sex: __Male __Female

Obtain from Personal Information Section

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

Obtain form 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)

___ 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
___ Arthritis	
___ 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 E

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)

Date of Birth: ____/__/__ (year/month/day)

Sex: __Male __Female

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

Obtain form Clinical Documents Section or Consult 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)

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
___ Arthritis	
___ 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)