

Spring 5-1-2015

Outcome Analysis and Quality Improvement for Inter-hospital Transfers of Pediatric

Carma Lynn Tobiassen

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DOI: <https://doi.org/10.31979/etd.tbhs-85u9>

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Outcome Analysis and Quality Improvement for Inter-hospital Transfers of Pediatric

Patients

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California State University, Northern California Consortium

School of Nursing

Doctor of Nursing Practice

April 7, 2015

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Dedication

I would like to dedicate this dissertation to the memory of my father, Richard A. Kramer, and my father in law, Leif Ray Tobiassen, who both believed I could be or do anything. Their kind words of inspiration and encouragement in the pursuit of excellence, forever linger with me.

Acknowledgements

I would like to thank the people that have been instrumental in the completion of this dissertation. There are so many important people to me, that I owe my success because of their support. First, I would like to thank the immediate members of my family. I would like to thank my four beautiful children, Michael Jr., Travis, Mirrae Tobiassen, and Tara Lizarraga, son-in-law Fernando Jr, and my grandchild, Fernando Lizarraga, III, for their love and support throughout this doctoral program. My deepest gratitude goes to my loving husband Michael Tobiassen who is my soul mate and the sole reason I am where, I am today. Without your constant support, strength, love, and patience, I could have never accomplished this dream.

A special thank you goes to my mother, Mary Kramer, mother-in-law, Arlene Tobiassen, Debra Ward, and my countless friends who believed in me when I doubted myself. They have stood by me through the good times and bad. My sister and best friend, Karen Hansen, has been my best cheerleader and kept me positive and strong when I wanted to just give up, and move to Wyoming.

I would like to thank my doctoral advisor, Dr. Ruth Rosenblum, for her encouragement, support and sense of humor throughout this program. She never doubted my ability from the first day. My chair, Colleen O'Leary-Kelley, your mentorship and knowledge was amazing. Thank you for your calm and encouraging ways. I would like to thank the members of my committee, Patrick VanWinkle, MD, Shareemae Salvador, and Kathleen Long, your ideas, willingness to help, and positive feedback was so appreciated. I would like to also thank Kaiser Permanente and especially, Julie Miller-Phipps, without your initial support and pursuit of our contract, this important research would not have been possible. Lastly, I would like to humbly thank Darren Murtari, MD and Mary Jo Mursa, whose commitment to family centered care and pediatrics inspires me to be all that I can be.

Abstract

Pediatric patients who initially present to a community hospital setting can be adequately cared for the majority of the time, in the emergency department (ED), on the pediatric ward (PEDS), and the post anesthesia care unit (PACU). When a pediatric patient is in need of specialized care or is decompensating and becomes critically ill, initial medical stabilization is required and the identification of a critical care bed and admitting physician are needed in a timely manner. Inter-hospital transfers (IHT) of pediatric patients are frequent occurrences, as more and more areas are consolidating their resources and Pediatric Intensive Care beds are becoming regionalized. When an IHT becomes necessary, there is a period of patient stabilization and transitional care that is required, before the critical care transport team arrives. This study will add to the scarce amount of literature on areas and opportunities for quality improvement and outcome analysis of pediatric patients transferred from a community hospital ED, PEDS or PACU without pediatric intensive care unit (PICU) resources.

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CHAPTER 1: INTRODUCTION

Outcome Analysis and Quality Improvement for

Inter-hospital Transfers of Pediatric Patients

Inter-hospital transfer (IHT), interfacility or secondary transfers of pediatric patients, from a community hospital to another facility occurs when a higher level of care is required or when the needs of the hospitalized patient exceed the resources of the hospital. The patient's condition either requires transfer to another facility that has specialty care that the current facility does not support, or is requiring a transfer to a pediatric intensive care unit (PICU) for the higher level of care. Occasionally, there is also the need to transfer to a facility that has a PICU, in the case that there might be further patient deterioration.

Transfers may also be necessary due to a need for specialized care not offered at a community hospital, examples would be, the need for dialysis or pediatric neurosurgical intervention. The amount of time required to arrange transport can take from one hour to multiple hours depending on the availability of resources, higher-level care beds, or complexity of the patient and type of transport required. The management and care of these patients during this time of waiting is considered crucial (Sethi & Subramanian, 2014). These transports can be initiated from the emergency department (ED), pediatric ward (PEDS), or the post anesthesia care unit (PACU).

When an IHT is necessary, the type of transport may take place via basic life support ambulance (BLS), advanced life support ambulance (ACLS), or pediatric critical care transport (CCT), transporting patients either by ground or air (Sethi & Subramanian, 2014). The appropriate mode of transport depends on many factors, including but not limited to, the nature of illness and urgency of transport, availability of transport, distance, weather, traffic conditions,

and cost (Sethi & Subramanian, 2014). The facilitation of transport for the critical pediatric patient to secondary facility can take more than three hours. Management of the patient during this critical time is crucial, and ultimately affects the safety and transport decisions in a rapidly deteriorating patient. This timing becomes a crucial part of the decision to identify the safest level and type of transport when there is a deteriorating patient.

When patients present in a decompensated state in the ED, or deteriorate after arrival in PEDS or the PACU, this is a time of high risk for the pediatric patients as they await transfer to a higher comprehensive level of care. For the health care team, stabilizing and caring for the patient prior to transfer places a significant burden on physicians, nurses, respiratory therapists, pharmacists, and other ancillary staff. This consumption of resources is multi-factorial and can also delay care of other patients in the ED, PEDS, or PACU. In addition to the clinical costs, there is a significant price associated with the financial costs involved with pre-transfer care and the actual cost of the mode of transportation.

Currently, there is a reported scarce amount of literature regarding IHT of pediatric patients that are critically ill or in jeopardy of decompensating in the ED, PEDS or PACU in a community hospital without PICU resources. There is also little known about IHT of pediatric patients requiring higher level of care both in the aspect of quality improvement and outcome analysis (Li, Monuteaux, & Bachur, 2011; Gregory, Nasrollahzadeh, Dharmar, Parsapour, & Marcin, 2008).

Background of the Problem

Critically ill children, managed in a community hospital setting without an intensive care unit, are subjected to undergoing an IHT to receive the adequate care during this vulnerable time. Unfortunately, children with life-threatening conditions will present to institutions that do not

offer higher levels of care (PICU), or there may be a situation where a patient that worsens or does not respond to a treatment and requires an IHT to an intensive care unit. During this crucial time, there is an expectation that care being provided for this child is consistent with current clinical practice guidelines. Several studies have emphasized that community hospital settings are a target for quality improvement in the area of IHT (Gilleland, McGugan, Brooks, Dobbins, & Ploeg, 2014).

An IHT of a pediatric patient is generally more infrequent when compared to adult populations, but a high cost event (Roussak, 2013). The potential morbidity and/or mortality rates can also be very high, when a child suddenly decompensates and is in need of specialized care. Physicians and nurses that care for pediatric patients in the community hospital setting typically have limited education, certificates and experience caring for these patients. Pediatric Advanced Life Support (PALS), and some annual education and/or other annual and specialty critical events trainings usually is considered the minimum qualification for initially taking care of critically ill pediatric patients.

When a child is brought to a community hospital emergency room, operating room, or pediatric ward, there is always the risk that the child may require a higher level of care. When the patient requires IHT, general hospital guidelines for administration and coordination of the ED for the care of children state, staff are required to be competent when caring for and supporting this patient, at the level of care required by the patient's condition, until the transport team arrives (Sethi & Subramanian, 2014). Once medical decision is made to transfer patient, the transport team may take anywhere from one to four hours to arrive. Literature has identified and evaluated, the need for quality improvement in the care and support of the pediatric patient just prior to the decision to transfer and while awaiting transport. Outcome analysis is also an

important measurement for the patients who are transported. See Figure 1 for concept map of study.

Statement of the Problem

Many questions must be answered in order to understand the complex needs of the critically ill pediatric patient who requires interfacility transfers for higher level of care (HLOC). The demographic variables, admission diagnosis, admission length, vital signs, pediatric early warning score (PEWS), indications for transfer, mode of transportation, course of stay in the PICU, and discharge disposition must be collected and analyzed in-depth to identify facility needs in the area of education, training, and area for quality improvement opportunities of children needing higher level of care transfer. To improve the quality of care in community hospitals in regards to decompensating pediatric patients, factors influencing inter-hospital transfers and outcome analysis must be identified.

Purpose of the Study

The purpose of this study is to evaluate inter-hospital transfers (IHT), to identify the types of patients requiring transfer, characterize the process itself, and analyze the outcomes of the patients post-transfer in an attempt to identify areas of improvement. The goal of this study is to identify areas to improve the transfer process in order to increase the safety of the pediatric patients and to determine the final outcomes or disposition of patients transferred.

Research Question (PICO)

For a child that requires specialty care or decompensates in a hospital setting, such as the ED, PEDS, or PACU and requires a transfer to another hospital or higher level of care at a facility that supports a pediatric intensive care unit, is there any relationship between pre-transfer information, inter-hospital transfer information and patient variables that will gain insight into an

educational opportunity, training, or prevention that may lead to quality improvement and improved patient outcomes?

Theoretical Framework

Patients arrive to seek care at a hospital for a variety of reasons, either emergently, electively or scheduled. These patients may present already critically ill, injured, or during their visit they may worsen or decompensate, despite the care and treatment they are receiving. When a higher level of care is needed there may not be a higher level of care unit at the current facility. Patients at those hospitals that do not have a higher level of care, such as a PICU, will need to be an IHT.

These patients can be very critical, depending if their condition is decompensating. A nursing theory that corresponds with patient who is at risk of decompensating is Roy's Adaptation Model (RAM). Sister Callista Roy developed the RAM in the mid 1960's (Whetsell, Gonzalez, & Moreno-Fergusen, 2011). Roy's theory is based upon concepts outside of nursing, specifically the work of physio-psychotherapist, Harry Helson who described a process of adaptation of a person to three different levels of stimuli (Whetsell et al., 2011).

Type of theory. Roy's "grand theory" has functioned as a foundation for the development of mid-range theories that explain the adaptation of humans to specific conditions such as diabetes or chronic pain (Walker & Avant, 2011). In 2001, Roy explained her "grand theory" and 25 years of middle range theory level research others had done to validate the model (Roy, 2011).

Assumptions of theory. Roy's model involves approximately 20 assumptions within three categories: philosophical, scientific, and cultural. Two main philosophical assumptions are: "humanism" which recognizes the "individual and subjective dimensions of human experiences

as knowing and valuing” and “veritativity” which is, “a principal of human nature that affirms a common purposefulness of human existence” and “each individual has a unique identity” (Whetsell et al., p. 415). Of the scientific assumptions, two specifically relate to this study according to Roy, “system relationships” which include acceptance, protection, and fostering interdependence and the integration of human environment meanings results in adaptation (Roy, 2009). From the cultural assumptions, the actual assumption that relates to the assessment of inpatients across different settings is, as RAM elements change within a cultural perspective, associations for education and research may differ from the experience in the original culture. (Roy, 2009).

Roy’s philosophical assumptions focus on the individual and the “value of identity” which is consistent with the principles of this study. One of the goals of this work is to contribute to the nursing body of knowledge regarding prevention of deterioration of an individual.

Theory applicability to setting and population. As a Grand Theory, RAM is applicable to the hospital and inpatient setting by explaining how an individual adapts. The population in this study must adapt to their environment in order to prevent deterioration prior to transfer.

Concepts of theory and definitions. Roy has four major metaparadigm concepts in her model that relate to nursing: person, environment, health and nursing (Masters, 2011). First, Roy (2009) describes a person in terms of a system that has two subsystems (cognator and regulator). These two subsystems act to maintain adaptation of the patient to the surroundings. Roy identifies the environment as “all conditions, circumstance and influences surrounding and second, affecting the development and behavior of persons and groups, with particular consideration of the mutuality of person and earth resources” (Roy 2009, p. 12). Lastly, Roy defines health and nursing as having a goal to “promote adaptation...thus contributing to health,

quality of life, and dying with dignity by assessing behavior and factors that influence adaptive abilities and to enhance environmental factors” (Roy 2009, p. 12).

Propositions of theory. RAM includes twelve relational propositions, of which five particularly relate to stimuli or surrounding environment, and the proposition also explains that both internal and external stimuli serve as inputs to the cognator subsystem (Masters, 2011). This proposition highlights the need to examine variables that are both internal to the patient (i.e. gender and age) as well as external (i.e. vasopressor administration). The next applicable proposition is that “adaptable level affects the human system’s ability to respond positively to a situation” (Masters, p. 135). The three final applicable propositions that most relate to this study encompass nursing goals and the role of the nurse: nurses need to promote health, nurses need to encourage adaptation, and nurses need to promote positive adaptation behaviors (Masters, 2011).

Relevancy for study. Roy describes the goal of nursing as to adopt successful adaptation (Masters, 2011). Through this work, collecting data, analyzing and comparing information about patients who deteriorated or required to be transferred to a higher level of care, the actions of nurses to promote successful adaptation will ultimately be achieved. Roy describes adaptive levels in which a person may or may not have safely managed internal and external stimuli (Whetsell et al., 2011). This is relevant to decompensating or worsening patients as follows: Roy’s three Adaptation Levels are: (1) integrated- relating to the stable acute care pediatric patient, (2) compensatory- a stable pediatric patient transitioning to unstable, and (3) compromised- which would include the point of patient deterioration. A hospitalized patient is exposed to various stimuli, and when a patient is no longer able to adapt to stimuli, their adaptation level will fall to “compensatory” and a coping process will be utilized (Whetsell, et al., 2011). At a compromised level, a patient’s coping processes are no longer effective. In the

case of patient's requiring IHT, deterioration from integrated to compromise can happen gradually or very suddenly, depending on the stimuli causing the deterioration.

Other researchers have used RAM to guide mid-range theory development; Roy's model could be applied to this study. This study will function to describe the first variables, which lead to an individual's inability to adapt to homeostasis. When unable to adapt, the individual can deteriorate and require an IHT. This information can be used to develop opportunities for quality improvement or possibly earlier detection and risk factors to prevent such deterioration.

Significance of Study

This study is an important addition to the body of research, for the understanding and analyzing safe and appropriate inter-hospital pediatric transfers. Many patients are transferred every day from one facility to another for various reasons. One of the most acute, life threatening and expensive inter-hospital transfers is that of a pediatric patient from a general pediatric ward, or PACU when the patient requires a higher level of care, to another facility that includes a pediatric intensive care unit. These transports usually occur suddenly, often without much warning, and are extremely costly, especially if air transport is the requisite method of transportation. It is important to understand the variables that surround both the decompensating pediatric patient, the need for IHT, the course of care required while awaiting transport, the course of care in the PICU, and the discharge disposition. The health care team involved with IHT need to understand these variables. This awareness will help to gain new knowledge and plan interventions, education, training and resources needed for prevention and or safe and quality care for decompensating pediatric patients.

Scope of the Study

Inter-hospital transfers are usually a last resort when caring for a pediatric patient. No one plans or desires to transfer a child, especially unnecessarily or under stressful conditions. There can be numerous problems and unfortunate occurrences that happen before and during the transportation of a critically ill child. When a facility can not safely care for the child at the level of care required, the physician has no other option but to begin the process of an inter-hospital transfer.

When an IHT occurs there are frequent systems and process inquiry, critiquing and debriefing sessions that take place with staff and physicians. Questions that are commonly asked by staff and physicians include: Could the transfer have been prevented? Did the staff alert the physician in a timely manner at the first signs of decompensation? Could the initial response of staff to the child's worsening condition be improved? Did the transfer really need to take place? What was the course of treatment and outcome of the patient at the referring hospital?

The issue examined and explored in this study is to gather new learning or opportunities for quality improvement or outcome analysis for pediatric patients transferred to a higher level of care from a community hospital without a pediatric intensive care unit. This study utilized retrospective data analysis for all children, ages 0-20 (the patients over 17 years of age, were California Children's Services program eligible) who underwent an inter-hospital transfer from a large Health Maintenance Organization's community medical center's ED, PEDS or PACU to another facility for the purpose of higher level of care. The data reviewed extended over a 24-month period from September 12, 2012 to September 12, 2014.

Definition of Terms

The following definitions are provided to ensure uniformity and understanding of these terms throughout the study.

Inter-hospital transfer (IHT): Moving of a patient from one facility to another outside facility.

Pediatric ward (PEDS): A pediatric ward in a community hospital, generally considered a medical or surgical unit that cares for children ages 0-14, but may take patients up to 21 years. This is considered an intermediate or lower level of care.

Pediatric intensive care unit (PICU): A specialized unit for critically ill or severely injured children that provides care for children ages 0-14, but may take patients up to age 21 years of age. This is considered a critical or high level of care.

Pediatric Emergency Warning Score (PEWS): This is a subjective and objective early warning scoring system that is assigned and calculated in three domains: behavior, respiration, and cardiovascular. The normal range can be 0-3. The total score can range from 0-13.

High Flow Nasal Cannula: A disposable nasal cannula tubing system that delivers oxygen in a higher liter flow capacity than a regular nasal cannula.

Non-Rebreather Mask (NRB): A medical device that covers the nose and mouth and delivers oxygen at higher flow and concentration than a simple oxygen mask.

Discharge Disposition: At discharge or transfer to what was the outcome or final destination for the patient: home, transferred to another facility, skilled nursing center, died.

Ground transport: Various types of ambulances are used for ground transport:

Basic life support ambulance: Ambulance properly equipped and staffed to provide basic life support to patients. These are used to transport patients with non-life-threatening medical emergencies.

Advanced life support ambulance: Ambulance properly equipped and staffed to provide treatment of life-threatening emergencies and advanced life support (e.g. endotracheal intubation, administration of drug or IV fluids, cardiac monitoring and defibrillation). The staff can be a physician, registered nurse, and/ or a respiratory therapist, as well as an emergency medical technician or paramedic. The staffing is usually dependent on the acuity of the patient needed during transport.

Patient transport ambulance: Ambulance used for transport of stable patients, usually arranged for scheduled visits to the hospital or clinics for treatment, physical examinations or transferring of stable patients from one hospital to another.

Air Transport: Two-types of air ambulances are:

Rotor wing or helicopter air ambulance: Recommended for journeys of over 50 miles (80 km). Ideal if there is a helipad or helistop in the hospital.

Fixed wing or airplane air ambulance: Recommended for journeys of over 150 miles (240 km). This aircraft has greater speed, pressurized cabin with more space, less noise and vibration.

Summary

Pediatric patients present to community hospitals every day, through scheduled admissions, emergencies, or electively for procedures or surgeries. Many community hospitals

have a general pediatric ward to care for patients and as described earlier, do not have a pediatric intensive care unit on site. When pediatric patients in the ED, PACU, or Pediatric ward begin to worsen or decompensate at these community facilities, the facility is no longer able to provide the required level of care, there becomes a gap in the management of the patient. In order to receive adequate care, the child will need to be transferred to a higher level of care. Inter-hospital transfers happen everyday for many reasons, but when there is a critically ill or injured child that needs immediate IHT, there can be many delays and untoward events that can happen as a result of poor or inadequate planning and providing insufficient care while waiting for the critical care transport team to arrive.

Research utilizing an observational descriptive approach regarding the reasons and conditions of most children who require IHT is scarce. These studies emphasize quality improvement and correlating outcome analysis of children transferred from a community hospital to improve the safety and quality of IHT.

CHAPTER 2: REVIEW OF LITERATURE

The inter-hospital transfer of a critically ill child for higher level of care intrinsically is fraught with many issues, barriers and risks. This review of literature will discuss the current literature, identify gaps from what is known about pediatric IHT and deliberate on areas for further study. When a child presents or is admitted to a facility without the certain specialty care services or PICU, there is an inherent risk of an IHT.

History of Inter-hospital Transfers

Systems and processes for inter-hospital transfers were first utilized by the military. The transportation of soldiers has been documented as far back as the early 1800's, during the Napoleonic wars (Blakeman & Branson, 2013). The importance of triage care of the injured and

provisions of specialized training to the caregivers in the field was recognized. The need to rapidly transport the wounded to a medical facility that could adequately care for the patient also brought the horse-drawn carriage with specialized caregivers to carry out the task of moving patients.

Civilian transport systems have improved based on the battlefield removal techniques and treatments over the past 150 years (Blakeman & Branson, 2013). The method of air transport of patients also began with the military as either a rotary blade or fixed wing airplane from the 1950's and 1960's, Korean and Vietnam wars (Blakeman & Branson, 2013). Civilian neonatologists and trauma surgeons replicated the military process of transporting patients for their private patients around the 1960's. Pediatric transport has evolved from the initial transport practices of the neonatal and trauma surgeons in the 1970's. The method and practice of IHT has only been used in practice for the last 40 years. This relatively new process may explain why there is such a limited amount of research on the topic of inter-hospital transfers.

Inter-hospital transfers are often needed for diagnostic or therapeutic interventions. However, the process of transporting patients contains certain risks and concerns as it can become a poorly and hastily arranged process that can lead to adverse events (Sethi & Subramanian, 2014). These transfers are needed when the required services and level of care are not available at the current hospital. An IHT may take place from multiple units such as; ED, PEDS, PACU, or PICU to PICU (Sethi & Subramanian, 2014). Many pediatric specialty groups and pediatric societies have come together and formulated some initial guidelines to conduct IHT in accordance with the healthcare systems of their respective countries (Sethi & Subramanian, 2014). This was done in an attempt to improve the quality and outcomes of IHT. Despite this

finding, there has been no any research identified that evaluated these guidelines or protocols for IHT (Sethi & Subramanian, 2014).

Each year there are approximately 28 million pediatric patients' visits to the ED. Most of these children (89%) are seen in community, not pediatric specific ED's. Only 9% of all ED's report having a pediatrician or pediatric hospitalist on duty, 24 hours a day, 7 days a week. Of all of these pediatric patients seen, a very small percentage (1.3%) required transfer to another hospital for continued care (Walls, Chamberlain, Strohm-Farber, & Klein, 2010).

Walls et al. (2010) completed a study using a prospective survey as a way to complete an assessment of the educational needs of referring hospitals with regard to the care of pediatric patients before transport to a pediatric ICU. Researchers collected 477 surveys (58% response rate) and 340 surveys were excluded, during a time span of September to December 2006. During the survey period, there were 817 eligible transports from 54 referring hospitals. The average age of the child transferred was 5.6 years, with a range of six days to 22 years. The most common diagnosis for transports was respiratory illness and asthma (16%) and seizures (9%), which fall in line the other studies on the most common reasons for transport. The survey was extremely easy and quick to complete, as it was only two questions, "How would you assess the overall quality of the care provided to the patient?" and "If you rated the care 1 - 4, what was/were the reasons?" The options for feedback on reasons for suboptimal care were: fluid management, choice of medications, under treatment, over-treatment, or misdiagnosis (Walls et al., 2010).

Key findings from Walls et al, (2010), demonstrated that the accepting PICU physician rated the pre-hospital care as suboptimal for 105 (22%) of 477 patients. The two most common diagnoses for suboptimal care were respiratory distress and asthma at 27.6% and fever at 11.4%

(Walls et al.). Despite the recommendations of the Institute of Medicine (IOM), American Academy of Pediatrics (AAP), and American College of Emergency Physicians (ACEP), few studies have shown the need for or impact of physician education on the emergency care of children. This study is an extremely valuable, in providing educational needs assessment, and to determining how many pediatric inter-hospital transports are receiving suboptimal care prior to transfer. In addition, by knowing this vulnerable and susceptible area of difficulty, there can be interventions, improved treatments and focused education programs for staff and physicians can be developed.

Conflicts in Outcomes

Studies were conducted in different countries that correlated different points of admission sources with death rates in adult ICU's. Interestingly, some studies have conflicting results and outcomes between admissions from the same hospital, depending upon if they were transferred from the emergency department or pediatric ward initially. Three studies that reported higher mortality rates and worse outcomes of IHT patients that were transferred from outside hospitals, as compared to admission from the same facility's ED or PEDS (Odetola, Davis, Cohn, & Clark, 2009; Sethi & Subramanian, 2014). Alternatively, two studies that reported higher mortality rates and worse outcomes for patients that were transferred from the same facility's ED or PEDS as compared to IHT patients. (Georges dos Santos El Halal, Beriberi, Filho, Trotta, & Carvalho, 2012; Gregory et al., 2008; Hill, Vingilis, Martin, Hartford, & Speechly, 2007). Few studies were found, despite an extensive search, which provided research on the topic of pediatric inter-hospital transfers and outcome data. Fewer studies have examined inter-hospital transfer data and identified areas for quality improvement.

Areas of Concern

There are known barriers and undefined roles in health care, such as; whom is assigned to manage the actual transport coordination or whom should be in charge of the optimal management of critically ill pediatric patients who initially present to community hospitals and how best to support the needs of the staff and health care providers prior to transferring to a higher level of care (Gilleland et al., 2014). Pediatric patients who are critically ill can be managed by the emergentologist, pediatric hospitalist, or depending on the age of the child, this care could possibly be provided by the neonatologist. Care of pediatric patients who are critically ill can be an extremely anxiety provoking event for health care professionals. Gilleland et al. (2014) published a qualitative needs assessment, which looked at five community hospitals with a total of 57 participants. Participants did not report seeing more than one critically ill child per month, which substantiates the rare instance of extremely critically ill children in the ED.

Gilleland et al. (2014) reported that to manage a very young pediatric patient caused more anxiety than adult patients presenting in cardiac arrest, and pediatric respiratory conditions were identified as the most anxiety provoking and having the greatest opportunity for educational need. This is important to understand which presenting pediatric health conditions additionally add to an already stressful situation. This qualitative study found that the resources required to care for a critically ill child often causes the emergency department staff to feel unable to meet their other patient's needs (Gilleland et al., 2014).

To improve the quality of care, discrepancies in the care of the pediatric IHT, health care delivery, and the effects on patient outcomes needs to be identified. Research on the day of week (i.e. weekend vs. weekday) and time of day (day vs. night) when the PICU admission occurs, may be associated with worse patient outcomes and mortality rates (Arias, Taylor, & Marcin,

2004). No significant association between mortality rates and the day of week that pediatric patients are admitted to the PICU has been found, but pediatric patients that were admitted to the PICU during evening hours showed a higher risk of death than those that were admitted during daytime hours (Arias et al., 2004).

Locations of Patients before Transfer to Tertiary Care

There are considerable parallels between outcomes and the location of the patient prior to transfer. Research has indicated that the location of pediatric patients before transfer to a tertiary pediatric care intensive care unit (ICU) has an impact on patient outcome. Additionally, those patients transferred as compared to those directly admitted to the PICU at a tertiary center had higher mortality rates (Gerber, Schorr, Ahmed, Dellinger, & Parillo, 2009). Researchers also found that outcomes may be better if patients were transferred from a referring center, compared to coming from within the same hospital but a different ward (Gerber et al., 2009).

Gilleland et al. (2014) discussed an important study dated in 1991 by Pollack & Alexander, “Improved outcomes, from tertiary center pediatric intensive care: a statewide comparison of tertiary and non-tertiary care facilities”, found that critically ill children, managed in a community hospital setting have a significantly greater chance of dying than those children that were treated in a tertiary hospital. This was one of the first published research articles on the need for IHT.

Mortality Rates and Inter-hospital Transfers

Admission source differences and age of child, has been compared with outcomes, which could be compared with IHT's. There are several findings in the study from Georges dos Santos El Halal et al. (2012), which correlated reasons for death in the PICU. The overall observed mortality rate of these children admitted to PICU were, of 1823 admissions, 188 (10.3%) ended

in death. Mortality rate increased significantly with age; the mortality rate was 0.9%, 8.9%, 12.3%, 10.4%, and 17%, retrospectively, for children aged ≤ 1 , 2-11, 12-59, 60-143, and ≥ 144 months ($p < 0.001$). The total population of this study, one-third (34.7%) of the patients were IHT's, from wards = 29.8%, ED=21.5% and PACU=13.5%. In this study, the highest mortality rate was from the general pediatric wards (17.4%). The results from this study are promising in that the mortality rates for IHT's are less than patients admitted directly from the ward, and the presence of co-morbidity was a significant confounder at two times higher in children.

Another study published the crude mortality rate (CMR) of 8% from nearly 58,000 children admitted to a PICU from unplanned admissions from other hospitals and a CMR of 6% from 15,843 unplanned admissions from the same hospital (odds ratio 1.27, 95% CI 1.16-1.38) (Phillippe & Lacroix, 2010).

Clinical outcomes at receiving hospitals varied widely, according to the admission source of inter-hospital transfer. The death rate of IHT patients overall, 66 (4%) died at a receiving hospital (Odetola et al., 2009). These findings also support earlier the involvement of the intensivist or dedicated critical care physicians (Gerber et al., 2009).

Importance of Research

The most common acute problem or condition that is encountered by decompensating pediatric patients necessitating inter-hospital transfer are airway and respiratory conditions, sepsis, and seizures, followed by head injuries and trauma (Gilleland et al., 2014; Odetola et al., 2009). The need for CPR on the date of IHT was 1.4% (Odetola et al., 2009). The frequency of transport was reported as few as one per month (Gilleland et al., 2014). A final outcome of this study was the need for pediatric-based education, appropriate resource and clinical practice guidelines in the participating community hospitals. Moving away from passive knowledge and

toward Web-based or high fidelity simulation training is also recommended (Gilleland et al., 2014).

Inter-hospital Transfer Problems

Issues and barriers that health care providers face when caring for a critically ill child, in a community hospital setting, has not been adequately studied before 2014 according to Gilleland et al. (2014). It was not surprising to learn that out of a respondent pool of 57 emergency department providers and front line staff, that taking care of pediatric patients in the community hospital setting rated the highest for causing the most anxiety (Gilleland et al., 2014).

Clinical characteristics and outcomes of pediatric IHT have not been well researched to date. (Odetola et al., 2009; Li, et al., 2012; Sethi & Subramanian, 2014; Wong & Levy, 2005). Many past studies comment on the scarcity of research regarding pediatric inter-hospital transfers. Despite the majority of research regarding the dearth of studies, there was one study that commented on the increasing number of IHT studies by Philpot, Day, Marcdante, & Gorelick, (2008).

Identified Gaps in the Research

More research is needed to evaluate the relationship between the time spent at the referring institution and the outcomes of transferred patients (Gerber et al., 2009). Effective recommendations or guidelines, as to which patients are more likely to suddenly deteriorate, also could use more research and development. (Boyle, Smith, & Archer, 2008)

Research studies have reinforced the community hospital setting as a target of quality improvement when they looked at outcome rates and mortality rates of pediatric patients with septic shock or meningococcal disease and improved rates when practice guidelines are followed (Gilleland et al., 2014). Outcomes in IHT of pediatric patients are can be found in the literature,

but significant rates of diagnostic discordance (lack of agreement), was a more scarce topic. According to Philpot et al., (2008), patients admitted to PICU's found a significant rate of diagnostic discordance. In their study of 3,645 pediatric patients with an IHT admitted to a PICU, 474 (11.5%) patients had discordance in their discharge diagnosis, compared to the reason they were transported.

A better understanding of why a community hospital is not able to provide a certain standard of care for a pediatric patient is needed. This may require a stronger and collaborative effort between the tertiary PICU's and the community hospital partners (Gilleland et al., 2014).

Outcomes of seriously ill children may differ considerably depending on where they received their initial care and what kind of facility they were transferred to. The study by Gilleland et al. (2014) is the first to address knowledge deficits from the perspective of the community health care provider.

There is an urgent need for improved understanding of pre-transfer clinical care and decisions being made by medical professionals that should be performed. A significant knowledge gap exists in pediatric acute and critical care medicine regarding the clinical outcomes and resource utilization among children who undergo IHT (Odetola et al., 2009).

Summary

In summary, much of the literature reviewed included many reasons, problems and outcomes resulting from pediatric inter-hospital transfers. There is limited research, if any, that include guidelines or minimal standards that could be developed or studied for quality improvement processes. Pediatric inter-hospital transfers continue to be a topic of interest by researchers attempting to understand the associated issues and problems. By examining problem areas based on transfer patterns, steps can be taken toward developing targeted interventions to

improve the care of IHT patients from a community hospital. To continue to expand on the knowledge of barriers and concerns that arise with IHT of pediatric patients, it has been suggested that one approach is to increase knowledge is to study this topic on a national level (Li et al., 2011).

CHAPTER 3: METHODOLOGY

Research Design

The research design for this study is a retrospective descriptive analysis of a community hospital pediatric transport system. Data was collected on consecutive patients zero to 20 years of age over a 24-month period from September 12, 2012 to September 12, 2104. Institutional Review Board (IRB) approval was obtained from both the study hospital and Fresno State University.

Population and Study Setting

The hospital of study is part of a large Health Maintenance Organization (HMO) operating in a large suburban community that cares for approximately 90,000 children less than 18 years of age. This geographical portion of this large HMO system consists of 15 outpatient clinics; three urgent care centers, two general EDs and one inpatient pediatric unit located in a primarily adult hospital. This hospital does not have a Pediatric Intensive Care Unit (PICU). There is also a second affiliated hospital in the county that does not have inpatient pediatrics. Both of these hospitals operate under once state license. Both EDs are staffed with general emergency medicine physicians, and physician assistants. There is a pediatric hospitalist on call 24/7 on one of the two campuses. The ED is not a trauma center and thus does not receive trauma patients via Emergency Medical Services. This HMO has other medical service areas in Southern California. Three of these areas have PICUs that we use for referrals for higher level of

care. This is an integrated system in Southern California in terms of administration, physician group, hospital system, and our electronic medical record (EMR).

This study reviewed the charts of all patients 0-20 years of age transferred from a medical center in Orange County to one of the three affiliated HMO tertiary medical centers (MC) that is referred to as MC- A, MC- B, and MC- C in this analysis, as the specific geographic locations of these tertiary medical centers are not needed for this analysis and might be a distraction. A fourth PICU that we used for transfer was a local children's hospital (MC-D) in Orange County, California, and the last medical center for transfers was a designated trauma center (MC-E) for our area. The dates of the inter-hospital transfers ranged from September 12, 2012 to September 12, 2014. Children up to 21 years of age were included for this study due to California Children Services (CCS) eligibility.

These specific dates were chosen in correlation with this medical center physically moving into a newly built, much larger medical center. With this move the pediatric bed licensing numbers were increased by three and added a twelve-bed adolescent ward as part of the pediatric unit. The pediatric ward is a California Children's Services (CCS) certified, 24-bed, combined pediatric and adolescent unit, which admits children 0-21 years of age.

Exclusion Criteria

The patients that were excluded included from this study: patients that were transferred to a psychiatric hospital, age over 18 unless identified by CCS (than can range up to 21 years of age), or repatriation to a home medical center. Other patients excluded were: 25 cases that were miscoded (actually went directly to a psychiatric facility), 15 cases were excluded for age greater than 17 years, not CCS eligible, and two were miscoded as they were discharged directly to home. The final case number included in the study was 246.

Data Sources

The information collected for this study was obtained from our electronic medical record (EMR), which contains all inpatient and outpatient information. The original data set of children transferred was identified by a clarity report utilizing the registration-admitting field of discharge disposition in the EMR. The primary physician caring for this patient entered this information into a computer field at the time of hospital discharge/transfer.

Transfer Procedure

This medical center has a transport system and guidelines that coordinate inter-hospital transfers 24 hours/7 days a week. The team that coordinates patient transfers can vary from department to department, depending on the time of day or resources available. The mode of transportation can be provided by an internal transport team direct phone number or by a contracted, specialized pediatric critical care transport team that is managed out of a children's hospital. The decision as to which transport team to use is decided by the treating physician at the sending facility. Once it is determined that the transport will be coordinated by the outside contracted critical care specialty service transport team, this team chooses the mode of transportation, either air or ground, based on patient condition, weather, or traffic patterns (which in the Los Angeles area can be quite significant). Please see Figure 2 for a diagram of this process.

Endpoints

Endpoints will be evaluated as a total and separately for the different levels of care (PEDS, PACU, ED).

- Percent of patients needing transfer
- Types of transfer (BLS, CCT- RN or RT, or Children's hospital – ground or air)

- Diagnosis types
- Age
- Need for intubation
- Need for vasopressors
- Length of time from initiation of transfer to transport team arrival
- PEWS scores prior to transport
- Reason for transfer (respiratory, cardiac, neurologic, surgical, specialty care)
- Accepting facility
- Disposition of patient at accepting facility

Research Procedures and Data Analysis

The descriptive data was analyzed utilizing SPSS software, version 21, SAS and Excel. Descriptive statistics were used for demographic and individual questions, which included measures of central tendencies, mean, median, and mode calculated for the center of the data set. Categorical variables were analyzed as either a mean \pm standard deviation or median with inter-quartile range (IQR). Continuous variables were analyzed for normal distribution. The differences between means were analyzed by ANOVA.

A chart review with primary inclusion criteria was performed. To add to credibility, validity, and dependability, the data was collected by a Clinical Nurse Specialist, along with this author, and the data was extracted from the following admission sources: admission logs from ED's on both medical centers, Anaheim and Irvine, admission logs from the PACU (pediatric surgical cases are only performed at the Anaheim medical center), and from the pediatric floors; as well as from the EMR as discussed above. For accuracy, twenty-five percent of the charts were, reviewed by both the Clinical Nurse Specialist and myself.

The tool that was used to extract the data was drawn from the demographic and data variables collected to compare inter-hospital transfers in like studies: Arias et al. 2004; Gilleland et al. (2014); Odetola et al., 2009; Li, et al., 2012; Sethi & Subramanian, 2014; Wong & Levy, 2005. The data collection spreadsheet was developed for recording the information extracted from the hospital's EMR. Data was used to describe the sample and for statistical analyses. Descriptive and inferential statistics were, computed by a contracted statistician. An examination of the data was analyzed and finalized by two co-investigators.

Data Collection Tool

See Appendix A

Assumptions of Study

It is assumed that all responses and information on the EMR are factual and true. Any patients that were transferred more than once were considered an independent admission.

Limitations of Study

There are limitations to this study. Because this was a retrospective chart review, patients may be missed due to the miscoding of the discharge disposition. Also, certain specific data points, such as the time of arrival, time to decide to transfer and transport type or time may be missing or incomplete. This study was a descriptive retrospective analysis; therefore in this type of study the accuracy of the information collected on patients cannot be verified. The data collected was limited to only what was retrieved from the EMR. There may be missing pieces of information on health connect that will result in missing data for statistical analysis and significance.

This study involves transfer data from only one geographical service area (Orange County). The results may not be generalized beyond the specific population from which the

sample was drawn. This study was also limited to the general categories listed on the data collection form.

Data Security

Data security was maintained at all times. The medical record numbers (MRN) of the patient's was adjusted to a coded number for the study. The original MRN was not on the same spreadsheet as the data collected. The spreadsheet was kept on a password protected private computer drive issued from study hospital. Three years after the conclusion of this study, all MRN and coded number on spreadsheet and data collections sheets will be destroyed.

Timeline

Data collection portion of this study was conducted over 9 months. The time period identified to collect information was retrieved from a patient population, September 12, 2012 to September 12, 2014.

CHAPTER 4: RESULTS

Patient Characteristics

During the 24-month study period there were 930 unplanned inter-hospital pediatric transfers from the ED, PEDS and PACU (Figure 3). Of these transports 246 patients met study criteria, a subsection of these were 153 emergent and 93 non-emergent patients were transferred. The emergent transfers were defined as patients that required higher level of care or PICU. There were 684 pediatric inter-hospital transfers for placement of children 0-18 years of age for psychiatric hospital needs. As this study was intended to collect data about pediatric patients in need of inter-hospital transportation for medical necessity, the 684 patients transferred for psychiatric support, the characteristics of this psychiatric subset was not included for the purposes of this study, other than to reflect the total number of all inter-hospital psychiatric

transports in a two-year period. The large number of pediatric psychiatric transfers obtained was unexpected and reflects the large number of pediatric patients in need of mental health.

The number of patients that will be emphasized for the purposes of this study are $n=246$ to represent all transfers and $n=153$ which describe those that were transferred for PICU. The total number of patients admitted and percent of inter-hospital transfers from ED (0.5%), PEDS (2.2%) and PACU (0.3%) is reflected in figure 4.

There are two main groups that were described and analyzed in this study. The overall characteristics of groups were illustrated in two tables: information about all pediatric inter-hospital transports included PICU (Table 1) and those patients that were only transferred to PICU (Table 7). There were three points of entry, of these; 109 were from ED, 41 from PEDS and 3 from PACU. Reasons for non-emergent transfers were; subspecialty care, rehabilitation facility, pediatric bed shortage, repatriation and due to specific insurance contracting requirements. Children transferred with a prevalence of general medical conditions were 35.4% of all transports and of the IHT that were admitted to a PICU, 36.6% had prior medical conditions.

Reasons for Inter-hospital transfers

Overall, the most common primary medical diagnosis for IHT to PICU admission was defined as respiratory and medical conditions (22% and 15.9%, respectively). Some examples of the grouping of medical diagnosis included; anemia, metabolic, lethargy, altered mental status, accidental ingestions, liver, and pancreas conditions. Head injuries (8.9%), sepsis (8.5%), gastrointestinal (7.3%), and cancer complications (6.1%), were among some of the other more common reasons for all pediatric inter-hospital transports. The medical conditions of: burns,

diabetic ketoacidosis, seizures, cardiac problems, trauma and other, accounted for less than 6% from each category (Table 1).

Patterns of Transfer

The admission entry location, reasons for transfer, mode of transportation, and time of day were some of the variables that were collected from each demographic group, all transports and those that were transferred solely to PICU. Among the 246 of all pediatric IHT, more than half of all transports occurred on the night shift (61.8%), and day shift facilitated 38.2% transfers (Table 2). When broken down further into three shifts (7am-3pm, 3pm-11pm, and 11pm-7am), evening and night shift combined facilitated 82.1% of all IHT. Eighty-seven percent of patients were transferred by ground and 10.4% traveled by air (23-transferred emergently by helicopter and 2- non-emergent were fixed wing plane due to the distance). When examining only emergent air transports (Table 3), there was a slightly higher rate of nighttime air transports (56.5%) and a higher percentage/total number of patients occurred from the pediatric ward. There were six patients transported by private car, five of these were burn patients that transferred to a specialty burn center and one transferred to another hospital for a sexual assault examination.

Age of Patients Transferred

Age was explored in two categories, mean and range of age from all pediatric patients transferred (6.01) and those transferred only to PICU (5.72) in Table 4. Age did not meet the main assumption of the non-parametric equivalent of a t-test, therefore, the Mann-Whitney was conducted (Table 6). Comparisons were analyzed between the ages of only patients transferred to PICU and all other patients transferred. By removing one case (outlier) the normalcy between the two groups was achieved. Both groups met assumptions for equal variance with a

significance of $p=0.07$ (Table 5 and Table 6). The practical significance of $p=0.07$ is an acceptable level for this type of comparison. There was practical significance between the ages of children transferred for PICU (5.72) compared to all other children transferred (6.49).

Outcome of all Inter-hospital transports

The discharge disposition of all inter-hospital transports that were transported to the affiliated HMO medical centers was reported as: home (84%), transferred back to the study hospital (8.5%), skilled nursing facility (3.2%), psychiatric hospital after being medically cleared (0.53%), and died (0.53%). The missing 58 cases transferred to non-affiliated hospitals and discharge dispositions and outcomes were not available. Cases that transferred back to the study hospital were 8.5%, of these, 100% of cases were discharged to home, causing the discharge disposition to home of all pediatric IHT transfers an impressive 92.6%.

Transports for Higher Level of Care (PICU)

A total of 153 pediatric patients were transferred emergently to higher level of care to one of the five medical centers, three of those are affiliated with our system, one is a local tertiary children's hospital and one is local designated trauma center. A pediatric hospitalist facilitated 85.6% of the transfers for higher level of care (Table 7). The locations of the pediatric patients transferred to PICU were: ED (72.2%), PEDS (26.8%) and PACU (2.0%). Most of these patients were transported by ground ambulance (83.7%) and an internal transport system transported 71.9% of the critical or worsening patients.

The tertiary facilities that 153 identified cases were transported for the majority was the affiliated HMO tertiary facilities that have an established PICU, MC- A (50.3%), MC- B (37.3%), MC- C (9.8%). This accounted for 97.8% of the cases. The other two tertiary pediatric centers (MC- D and MC- E) received 4 (2.6%) of the IHT patients.

Condition of the patient pre-transport is reflected in Table 7. A large percent of these transports did not require any type of mechanical ventilation or intubation (65.4%) and most patients did not receive vasopressors (98%) initiated prior to transport. The medical reasons for IHT to a PICU, was similar overall to all patients transported. Respiratory diagnosis (30.7%) and medical conditions (27.5%) accounted for half of all IHT for higher level of care.

The diagnostic accuracy of the pediatric patient prior to IHT by the pediatric hospitalists and emergentologist was almost perfect (98.7%). One case only, a newborn infant, was transferred with a possible septic diagnosis, and two days later, was correctly diagnosed with an inborn error of metabolism.

Transport Ride Times

There were three main affiliated HMO tertiary hospitals that received the majority of the IHT for PICU. The distance from the study hospital and number of patients received is as follows:

MC- A (distance=34.6 miles) received 77 PICU patients (50.3%)

MC- B (distance=19.1 miles) received 57 PICU patients (37.3%)

MC- C (distance= 39 miles) received 15 PICU patients (9.8%)

The missing four patients were transferred to a non-affiliated medical center; therefore transport times were not accessible.

Table 8 provides an average transport time per facility using a one way between analysis of variance. These calculations were computed after removing two of the case outliers. MC- C is the farthest from the study hospital and average ride time of IHT is 1.3 hours. MC- A is next farthest from study hospital in miles and the averaged time was 1.1 hours. The closest facility, MC- B, in miles also calculated the shortest time traveled at 0.7 of an hour.

The main effect of within subjects variable time to travel to PICU shown a statistical significance using the critical alpha of 0.05 ($F(2,144) = 23.247$, $p=0.000$). There was a statistically significant difference between the medical centers ($p < 0.001$).

The post hoc comparison using Bonferroni revealed that it took significantly less time to travel to MC- B compared to MC- A and MC- C. There was a small difference in the time it took to travel to MC- A and MC- C.

There is a significant difference at $p \leq 0.001$ between transport times of the three tertiary facilities. MC- B is statistically significantly the closest travel time, however due to the limitations of certain sub-specialists at medical center, the decision of which tertiary facility is not always due to the closest facility. Driving in Southern California area any time of the day or night can be challenging, as traffic patterns can be at a standstill much of time. Much of the time, the decision for air transport is chosen over ground, due to traffic patterns as much as decision due to condition of the patient.

Comparison of PICU Length of Stay between Medical Centers for IHT

We compared the length of stay between the three in-system PICUs (Table 9). We were not able to collect data points on the non-affiliated PICUs accounting for four cases and thus this data is not included.

The main effect of within subjects variable length of stay in a PICU shown a practical significance using the critical alpha of 0.05 ($F(2,131) = 2.811$, $p=0.06$). The decision to keep the practical significance was further established running the power test. This test was able to prove a small to medium effect size. There was a practical significance in length of stay between the medical centers ($p < 0.001$). The

The post hoc comparison using Bonferroni revealed that it took significantly less time to

travel to MC- B compared to MC- A and MC- B. There was a small difference in the time it took to travel to MC- A and MC- C.

Clinical Outcomes of PICU Inter-hospital Transports

The outcomes of the 153 pediatric patients that transferred to PICU were as follows: discharge disposition of home (81.7%), transfer back to study hospital (13%), skilled nursing facility (5%), specialty tertiary medical center (outside of HMO) (3.9%), psychiatric hospital after medically cleared (0.6%), died (0.6%) and unknown (1.3%). Of the cases that transferred back to the study hospital (8.5%), 100% of those were discharged to home. The combined total of discharge disposition to home is 88.2%.

CHAPTER 5: DISCUSSION

Outcome Analysis

Overall, a low percentage of pediatric transfers from the study hospital was found, with a rate of 0.5% from the ED, 2.2% from PEDS, and 0.3% from the PACU (Figure 4). Other studies have shown around 1.8% transfers from the total ED pediatric patient alone. (Gattu, R, Teshome, G., Cai, L., Wright, C., & Lichenstein, R. 2014). This small percentage of patients requiring inter-hospital transport as compared to other systems may be due the uniqueness of our community hospital which has in-house 24/7 coverage of a pediatric hospitalist to attend to the patients on the pediatric floor as well as any consultations from the ED. In addition, for our pediatric surgical patients, there is a system to determine if elective surgeries are appropriate for our community hospital that does not have a PICU. The pediatric surgeon and pediatric anesthesiologist evaluate the appropriateness for surgery, screen each pediatric surgical candidate, and if necessary, a third consultation from a pediatric hospitalist will be completed. If any of these three consultants feels that the patient requires a higher level of care, the case is

referred to one of our three tertiary care centers. For emergent or urgent cases, the case is done at our facility and then transport is arranged from the PACU.

Other studies have shown a sizeable discordance between the diagnosis given at the sending facility and that reached at the receiving facility at an 11.5% occurrence (Philpot et al. 2008). We found a high agreement rate of 98% for the primary diagnosis between our sending and receiving facilities. This high rate of agreement is partially influenced by the fact that this facility is part of a large integrated system in terms of the physician group, hospital system, administration, and integrated EMR. We have the capability to talk directly to the receiving facility for help with diagnosis and management, which improves the continuity and consistency of care. The Intensivist and Hospitalists at the receiving facility also have the ability to log into the inpatient EMR record and see all the components of the record including vital signs, lab and radiology results, medications prescribed, and past medical history.

There was a significant difference in length of stay between our three in-system PICUs. The impression is that this difference is partially due to when the PICU was first established and the amount of subspecialty support that exists at the respective medical centers. The PICU with the highest length of stay has been the primary tertiary medical center with complete subspecialty support. The other two PICUs were opened more recently and are still developing some aspects of their subspecialty care. Thus at this time, the most critically ill patients at times are preferentially sent to the largest center (MC-A), which did receive the highest percentage of our patients.

The death rate of all transports and separately IHT for PICU was a noteworthy at 0.6%. Out of the total 246 pediatric IHT there was only one patient that died (0.4%). This communicates a high quality and extremely safe IHT program, as well as the improved quality

and safety of the integrated HMO system in Southern California both pre-transport, during and post-transport of children.

Transports for psychiatric placement were the largest population of unplanned transfers. This group of patients is not the focus of this analysis, but it does seem to highlight what is known in the medical field and what also has been in the mainstream media more in the recent years. Patients with mental or psychiatric illness, is a population that the medical community need to continue to find ways to improve care and support.

Quality Improvement

Pre-transport coordination and communication. The referring physician is the one to initiate the first call to one of the three tertiary centers to see which facility has an available bed. If the physician receives a “no-bed”, they will continue to call the next tertiary center and the next. If all three do not have a bed, there is an escalation process to send the patient to a non-contracted nearby children’s intensive care unit. This current process has a great deal of waste for the physician’s, as they spend valuable time in the ED, PEDS and PACU bed-finding and arranging transportation. Once the physician has an accepting physician and available bed, there generally is no delay in the transport team arriving. There are times that the contracted pediatric critical care transport team has a backlog of calls and transport can be delayed upwards of 2-3 hours. The HMO internal transportation unit has very small delays and arrives generally within the hour of the request. An opportunity for expanding the internal transportation unit may include transferring extremely critical children both by ground and air would be valuable.

Improving documentation. Having an EMR available to collect data is a reliable method as long as the information needed is recorded and available. A problem was discovered, however, many of the inter-hospital transfer authorization form and ambulance transport forms

are paper documents were missing from the EMR. These paper forms contain important medical and legal authorizations and documentation, and they are required to be scanned into the EMR. The sending facility initiates the IHT form, which is signed by the parent or guardian. The transport company initiates the transport documentation and leaves a copy with the patient following transport. These paper forms are sent to a scanning department, which will scan and upload the document into the patient's EMR, upon the patient's discharge. This study found a significant number of missing ambulance transport forms and inter-hospital transport authorizations. For the ambulance forms scanned in, most were not legible, and the form was stamped "poor original quality". This finding is an opportunity to improve documentation.

Implications for Nursing Practice and Conclusions

Nursing practice carries an integral role in the success of the positive patient outcomes in this study. Registered Nurses (RN) involved in the units that care for children at this study hospital have had many hours of pediatric focused training, as well as PALS certification. In the last three years, the PEDS RN's have been through annual mandatory critical event team training (CETT) and bi-monthly mock code training. Care of the critically ill or decompensating patient is also a focus of the annual pediatric skills day. The PACU and ED have attended a pediatric focused CETT training in the last three years. All of this extensive pediatric training and education play a strong role in the high quality of care the pediatric patients receive.

The findings from this study show overall, that a community hospital that does not have a PICU on-site, can provide high quality care and safe care to pediatric patients and if necessary, can also coordinate a successful and timely IHT. Literature has shown that outcomes in many community hospitals are not consistent with the successful outcomes of this study. The promising outcomes of this study, in regard to discharge disposition, accuracy of diagnosis pre-

transport, lengths of stay in the PICU, and transport time en route, demonstrate that if there is a collaborative integrated system, by increasing the regionalization of higher level of care beds (PICU's) is both a likelihood and cost effective option to will providing care to children with improved outcomes.

This study hospital without a PICU was able to ensure effective and efficient care in the ED, PEDS and PACU for the children it serves. This analysis has shown that the process of IHT of pediatric patients either for emergent or non-emergent reasons, overall does an excellent job, but may benefit from improvement in the physician lead "bed-finding" process. The development of a central calling hub to find available PICU beds, would free up the health care provider to spend valuable time in the management of pre-transport care, instead of calling upwards of four facilities if needed.

Recommendations for Further Study

Future work should investigate the association between clinical outcomes at the receiving hospitals and in both areas; the time to decide to transfer and pre-transport care of the critically ill patient. The recommendation due to the superior outcomes the study, would be to continue the process of annual training of RN's both in structured pediatric focused CETT, and mock code training to sustain the higher level of competency of general pediatric nurses and emergency department nurses as they do not have the benefit of having the support of pediatric critical care nurse. The unexpected finding of 684 pediatric patients that required IHT for psychiatric hospitalization is also an area that would warrant further investigation.

Efforts to continually improve the care of critically ill children by better understanding of the pre-transport and inter-hospital transport process will ensure the continued high quality and improved outcomes of this study. Hospitals with general pediatric wards, without pediatric

intensive care units can safely provide the majority of care for pediatric emergency, medical, surgery and hospital care with adequate training and resources.

References

- Arias, Y., Taylor, D., & Marcin, J. (2004). Association between evening admissions and higher morality rates in the pediatric intensive care unit. *Pediatrics*, *113*, 530-534.
- Blakeman, T. C., & Branson, R. D. (2013). Inter- and intra-hospital transport of the critically ill. *Respiratory Care*, *58*(6), 1008-1021.
- Boyle, M. J., Smith, E. C., & Archer, F. (2008). A review of patients who suddenly deteriorate in the presence of paramedics. *BioMed Central Emergency Medicine*, *8*(9), 1-11.
- Gattu, R., Teshome, G., Cai, L., Wright, C. & Lischenstien, R. (2014) Inter-hospital pediatric patient transfers: Factors influencing rapid disposition after treatment. *Pediatric Emergency Care*, *30*(1), 26-30.
- Georges dos Santos El Halal, M., Barbieri, E., Filho, R. M., Trotta, E., & Carvalho, P. R. (2012). Admission source and mortality in a pediatric intensive care unit. *Indian Journal of Critical Care Medicine*, *16*(2), 81-86.
- Gerber, D. R., Schorr, C., Ahmed, I., Dellinger, R. P., & Parillo, J. (2009). Location of patients before transfer to a tertiary care intensive care unit: Impact on outcome. *Journal of Critical Care*, *24*, 108-113.
- Gilleland, J., McGugan, J., Brooks, S., Dobbins, M., & Pleog, J. (2014). Caring for critically ill children in the community: A needs assessment. *British Medical Journal Quality Safety*, *23*, 490-498.
- Gregory, G., Nasrollahzadeh, F., Dharmar, M., Parsapour, K., & Marcin, J. (2008). Comparison of critically ill and injured children transferred from referring hospitals verses in-house admissions. *Pediatrics*, *121*, 906-911.

- Hill, A. D., Vingilis, E., Martin, C. M., Hartford, K., & Speechly, K. N. (2007). Inter-hospital transfer of critically ill patients: Demographic and outcomes comparison with non-transferred intensive care unit patients. *Journal of Critical Care*, 22, 290-295.
- Li, J., Monuteaux, M., & Bachur, R. (2011). Interfacility transfers of non-critically ill children to academic pediatric emergency departments. *Pediatrics*, 130, 83-92.
- Masters, K. (2011). Roy Adaptation Model: Sister Callista Roy. In *Nursing theories: A framework for professional practice* (1st ed., p. 127-142). Sudbury, MA: Jones & Bartlett Learning.
- Odetola, F. O., Davis, M. M., Cohn, L. M., & Clark, S. J. (2009). Inter-hospital transfer of critically ill and injured children: An evaluation of transfer patterns, resource utilization, and clinical outcomes. *Society of Hospital Medicine*, 4(3), 164-170.
- Phillippe, J., & Lacroix, J. (2010). Improving inter-hospital paediatric transport. *The Lancet*, 376(9742), 660-661.
- Philpot, C., Day, S., Marcdante, K., & Gorelick, M. (2008). Pediatric inter-hospital transport: Diagnostic discordance and hospital mortality. *Pediatric Critical Care Medicine*, 9(1), 15-19.
- Roussak, P. (2013). Centralization of paediatric intensive care and 24-hour retrieval service. *British Journal of Nursing*, 23(1), 25-29.
- Roy, C. (2009). *The Roy adaptation model* (3rd ed.). Upper Saddle River, NJ: Pearson.
- Roy, C. (2011). Research based on the Roy Adaptation Model: Last 25 years. *Nursing Science Quarterly*, 24, 312-320.
- Sethi, D., & Subramanian, S. (2014). When place and time matter: How to conduct safe inter-hospital transfer of patients. *Journal of Anaesthesia*, 8, 104-113.

Walker, L. O., & Avant, K. C. (2011). *Strategies for theory construction in nursing* (5th ed.).

Boston, MA: Prentice Hall.

Walls, T. A., Chamberlain, J. M., Strohm-Farber, J., & Klein, B. L. (2010). Improving pre-transport care of pediatric emergency patients: An assessment of referring hospital care.

Pediatric Emergency Care, 26, 567-570.

Whetsell, M. V., Gonzalez, Y. M., & Moreno-Fergusen, M. E. (2011). Models and theories focused on a systems approach. In J.B. Butts, & K. L. Rich (Eds.) *Philosophies and Theories for Advanced Nursing Practice* (pp. 413-445). Sudbury, MA: Jones & Bartlett Learning.

Wong, K., & Levy, R. D. (2005). Inter-hospital transfers of patients with surgical emergencies:

Areas for improvement. *Australia Journal of Rural Health, 13*, 290-294.

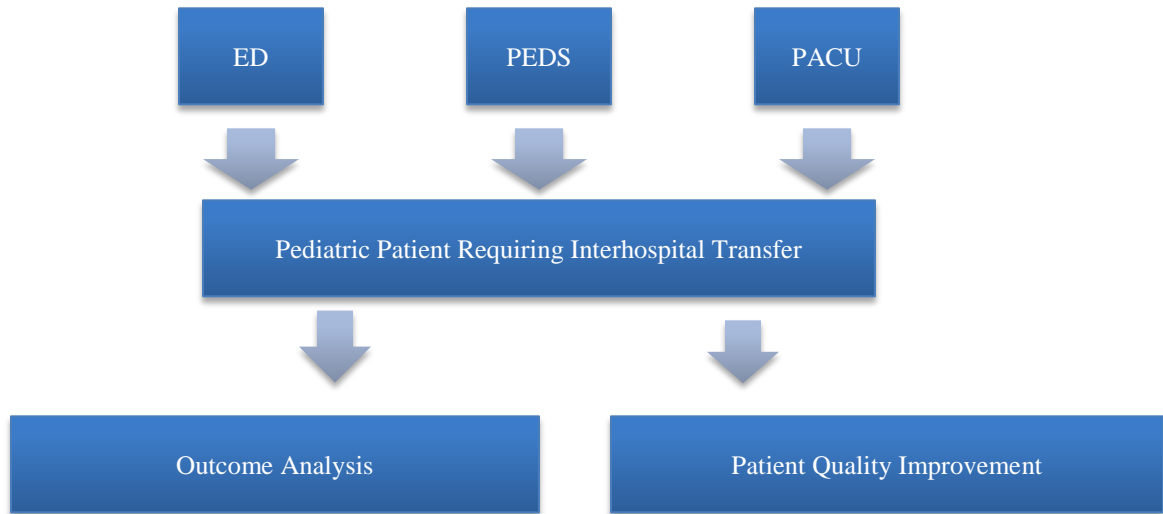


Figure 1. Concept map of study

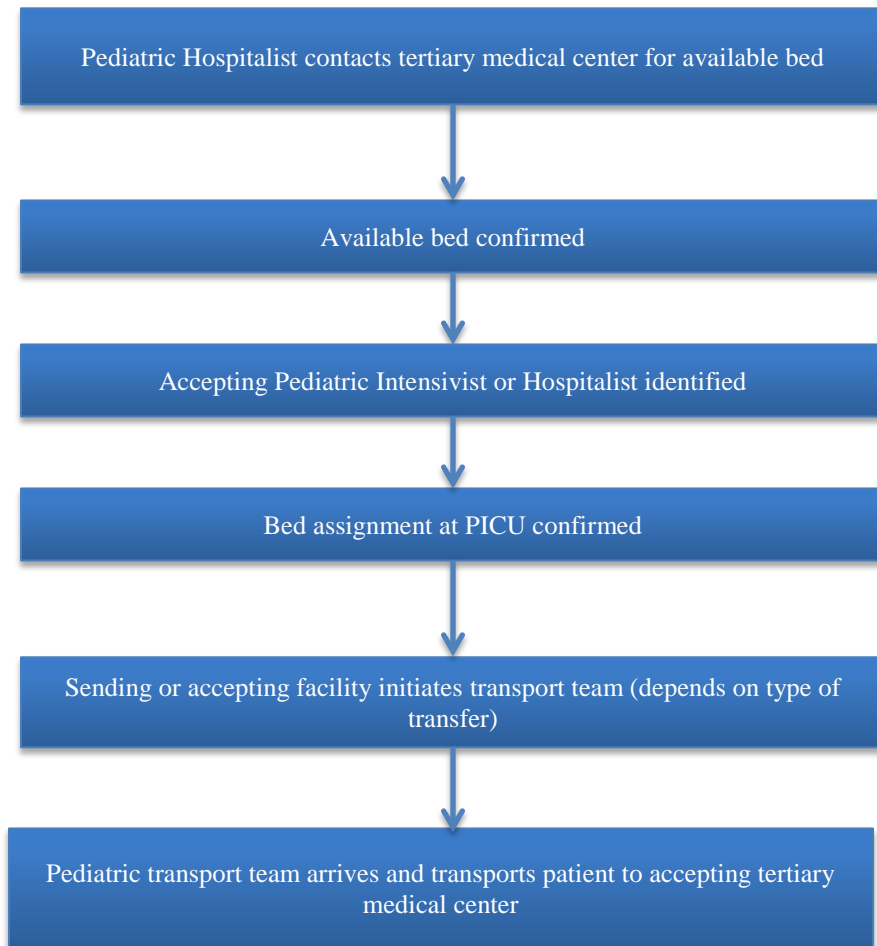


Figure 2. Diagram of the transfer process used at a HMO community medical center

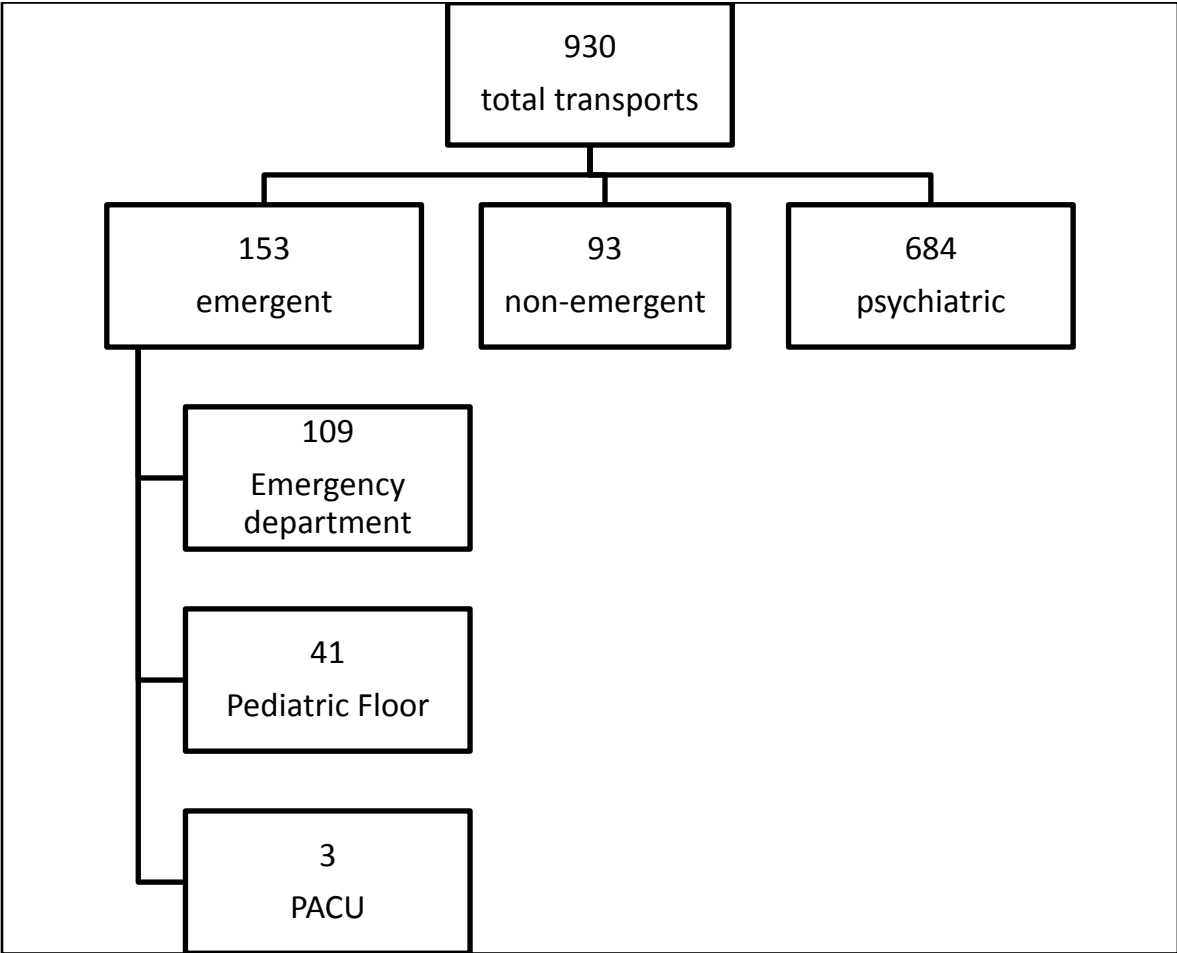


Figure 3. Total transports broken down by type

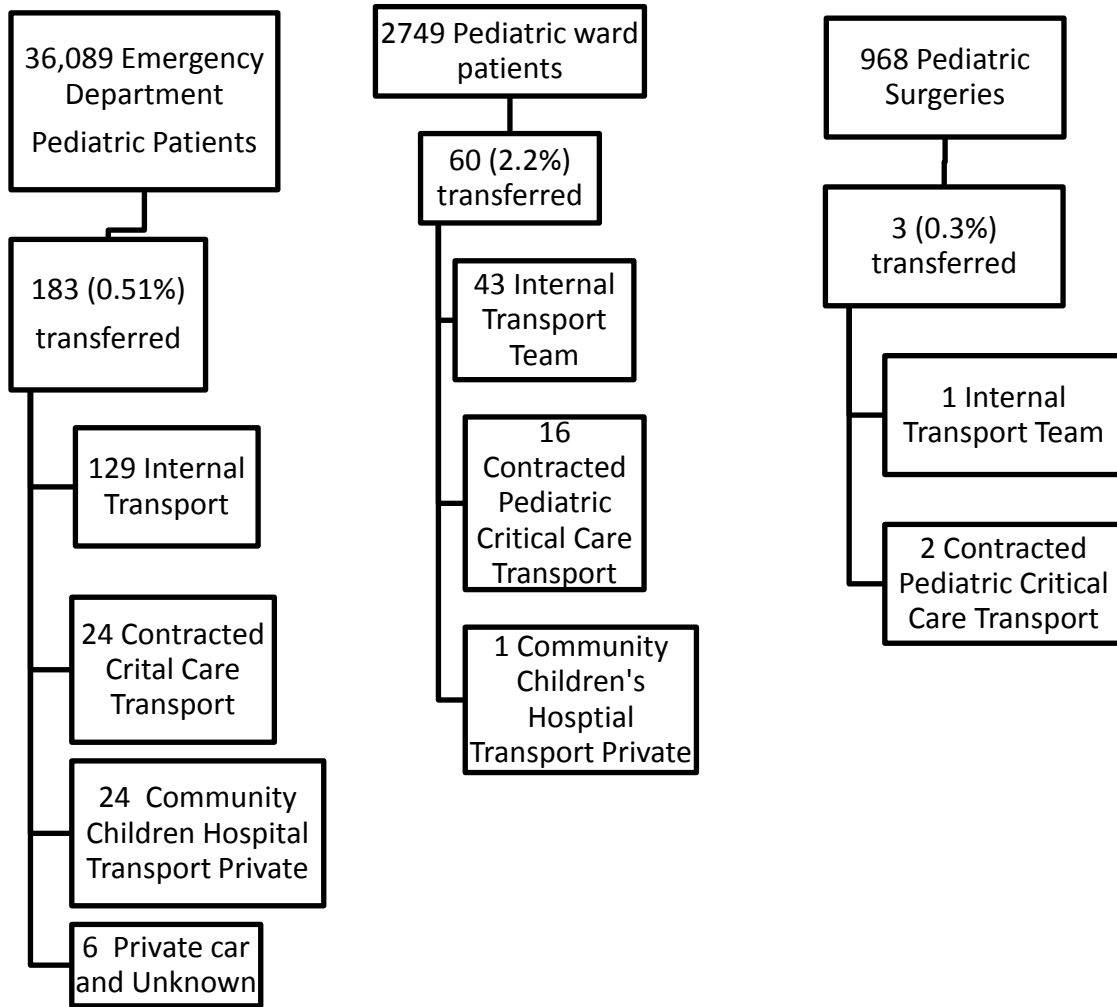


Figure 4. Number and percent of patients in Emergency Department, Pediatric Floor and Postoperative Unit requiring transfer

Table 1.

Demographic and Treatment Characteristics of Total Population Transferred

Descriptive Variables	Total population (n=246) No of patients (%)	
Sex		
Female	117	(47.6)
Male	129	(52.4)
Race		
African-American	11	(4.5)
Asian	38	(15.4)
Caucasian	99	(40.2)
Hispanic	80	(32.5)
Other	18	(7.3)
Age		
<=6	156	(63.4)
7-12	33	(13.4)
13-19	57	(23.2)
Admission entry location		
Emergency department	183	(74.4)
Pediatric ward	60	(24.4)
Post anesthesia care unit	3	(1.2)
Reasons for transfer		
Higher level of care	153	(62.2)

Insurance reasons	35	(14.2)
Specialty care	42	(17.0)
Pediatric bed shortage	6	(2.4)
Acute Rehabilitation	6	(2.4)
Repatriation home facility	4	(1.6)
<hr/>		
Accepting facility		
HMO facility	181	(73.6)
Non-HMO facility	65	(26.4)
<hr/>		
Mode of transport		
Ambulance	215	(87.4)
Air	25	(10.4)
Private car	6	(2.44)
<hr/>		
Primary Payor		
HMO Insurance	207	(84.1)
Commercial	18	(7.3)
Medicaid	16	(6.5)
Self-pay	5	(2)
<hr/>		
Medical condition requiring transfer		
Respiratory	54	(22)
Medical	39	(15.9)
Head Injury (Skull fracture)	22	(8.9)
Sepsis/Infection	21	(8.5)
GI/ Dehydration	18	(7.3)

Surgical	16	(6.5)
Cancer treatment complications	15	(6.1)
Burn	13	(5.3)
Diabetic Ketoacidosis	13	(5.3)
Seizures	12	(4.9)
Cardiac	9	(3.6)
Trauma	7	(2.8)
Other	7	(2.8)
<hr/>		
Prior admission to hospital		
Yes	87	(35.4)
No	159	(64.6)
<hr/>		

Table 2

<i>Time of Day all Transfers</i>	<i>Day</i>	<i>Night</i>
	<i>7:00 a.m. to 6:59 p.m.</i>	<i>7:00 p.m. to 6:59 a.m.</i>
ED	61 (24.8)	122 (49.6)
PEDS	32 (13.0)	28 (11.4)
PACU	1 (0.4)	2 (0.8)
Total	94 (38.2)	152 (61.8)
<hr/>		

Table 3

<i>Time of Day all Helicopter Transfers</i> <i>n=23*</i>	<i>Day</i> <i>7:00 a.m. to 6:59 p.m.</i>	<i>Night</i> <i>7:00 p.m. to 6:59 a.m.</i>
ED	3 (13)	8 (34.8)
PEDS	6 (26.2)	5 (21.7)
PACU	1 (4.3)	0 (0)
Total	10 (43.5)	13 (56.5)

Note. * 2 missing cases were transported by fixed wing airplane due to extended distance

Table 4

<i>Mean Age in Years</i>	
Age of all transferred	n=246
Mean age in years	6.01
Age range in years	0-19
Age of all children transferred to PICU	n=153
Mean age in years	5.72
Age range in years	0-17

Table 5

Comparison of all Other Transfers Age in Years to PICU only Age in Years

Age of all other transferred (non-PICU)	n=246	Std Error
Mean age in years	6.36	0.605
Age range in years	0-17	
Age of children transferred to PICU	n=153	
Mean age in years	5.72	0.490
Age range in years	0-17	

Table 6

Age Differences Between PICU and all Children Transferred

	n	M	SD	t	df
All other children transferred	93	6.36	5.80	-.812	243
PICU	153	5.73	6.07	-.022	198.6
Total	246	6.25			

Note. Mann-Whitney $u=(z = -1.469)$ $p=0.7$ at $CI \leq 99\%$; $u=0.06$, $p=0.07$

Table 7

Inter-hospital Transfers for Higher Level of Care (PICU)

Type of physician managing pre-transport care	Total population (n=153)	No of patients (%)
Pediatric Hospitalist	131	(85.6)
Emergentologist	20	(13.1)
Other specialist	2	(1.3)

Location of patient prior to transport		
Emergency room	109	(72.2)
Pediatric ward	41	(26.8)
Post anesthesia care unit	3	(2.0)

Medical reason for transport to PICU		
Respiratory	47	(30.7)
Medical	42	(27.5)
Head Injury	20	(13.1)
Diabetic Ketoacidosis	12	(7.8)
Cancer related condition	10	(6.5)
Sepsis	9	(5.9)
Seizures	6	(3.9)
Surgical	3	(2)
Other	3	(2)
Multiple trauma	1	(0.6)

Management of airway prior to transport		
Breathing without assistance	100	(65.4)
High flow nasal cannula	15	(9.8)
Intubation/ventilator	12	(7.8)
Simple mask with blow by oxygen	10	(6.5)
Nasal cannula < 2 liters	10	(6.5)
Non-rebreather mask	6	(3.9)

Vasopressors prior to transport			
	No	148	(98)
	Yes	2	(2)
Mode of transport to PICU			
	Ground	128	(83.7)
	Air	23	(15)
	No information	2	(1.3)
Transport company			
	Internal transport company	110	(71.9)
	Contracted external transport company	42	(27.5)
	No information	1	(0.6)
Accepting hospital facility			
	HMO Medical Center -A	77	(50.3)
	HMO Medical Center -B	57	(37.3)
	HMO Medical Center -C	15	(9.8)
	Local Children's hospital MC-D	3	(2)
	Local trauma center MC- E	1	(0.6)
Diagnosis from sending facility same as admitting facility			
	Yes	151	(98.7)
	No	1	(0.6)
	Unknown	1	(0.6)
Outcomes from PICU			
	Home	125	(81.7)

Transfer back to community pediatric ward	13	(8.5)
Skilled nursing facility	5	(3.3)
Specialty tertiary center	6	(3.9)
Psychiatric hospital	1	(0.6)
Died	1	(0.6)
Unknown	2	(1.3)

Seasonality of transports

Winter (November, December, January)	43	(28.1)
Spring (February, March, April)	42	(27.5)
Summer (May, June, July)	30	(19.6)
Fall (August, September, October)	38	(24.8)

Table 8

Transfer Ride Time from Sending Hospital to Receiving PICU

PICU (within MC-A, MC-B and MC-C)	M	SD	n
MC- A	1.1901	.47353	77
MC- B	.7251	.36595	55*
MC- C	1.3567	.43368	15
Total	1.0331	.49375	147

Note. M in hours; *2 outlying cases removed; p- 0.001; CI \leq 95%

Table 9

Length of Stay of Patients Admitted to PICU at Transfer Facility

PICU (within MC-A, MC-B, and MC-C)	Mean	Std. Deviation	N
MC- A	4.2351	2.84071	68
MC- B	3.4414	2.61096	54
MC- C	2.4895	1.78077	12
Total	3.7590	2.71040	134*

Note. * 12 outlying cases removed; p-0.064; *CI \leq 95%

Appendix A

Data Collection Tool

Transfer Study Data Abstraction Sheet

Revised August 5, 2014

PI: Carma Tobiassen

Patient Study #:

MRN:

Patient Initials:

Age in years or months:

Admission Diagnosis:

Final Pediatric Early

Warning Score (PEWS):

Airway management at time of transfer:

Oxygen delivery system: intubated simple mask NC HFNC NRB

Vasopressor infusion at time of transfer: yes or no

Reason for transfer (noted on transfer summary):

Past admissions, transfers or PICU admissions for patient:

#1:

#2:

#3:

Variable	Response
Demographics	
Age	
Sex	
Weight (kg)	
Admission Diagnosis	
Admission Source (ED/Direct admit)	
Date/ Time of Admission to ED/PACU/PEDS Ward	
Patient Condition	
Analgesics/narcotic prior to deterioration Y/N if yes date and time	
PEW's Score	
Airway Management at time of transfer	
Vasopressor Infusion prior to transport team arrival Y/N	
Reason for transfer	
Transfer data	
Location of Patient	
Date /time of Transport	
Day of week	
Date/Time transport team called	
Date/Time transport team arrived	
Mode of Transport (Air/Ground) BLS or CCRT/RN	
Length of Time prior to transfer	
Code White called Y/N	

Post Transfer Outcome	
Accepting facility name	
Type of ward/unit admitted to	
Admitting Diagnosis	
Number of hours or days in hospital	
Discharge Deposition (Home/Transferred back to OC/Skilled Nursing/Died)	

Appendix B

Kaiser Permanente IRB Approval Letter

Approval Notice

Institutional Review

October 06, 2014

KPSC Principal Investigator(s)

Carma Tobiassen, MSN, KPSC - Medical Facility Administration

3440 E. La Palma, Anaheim, CA 92806

KPSC Co-Investigator(s)

Patrick J Van Winkle, MD

Non-KPSC Co-Investigator(s)

None

Study Title: Copy of Outcome Analysis and Quality Improvement for Interhospital Transfers of Pediatric Patients (#10470)

Study Expiration Date: 09/25/2015

On 10/04/2014, a subcommittee of the Kaiser Permanente Southern California (KPSC)

Institutional

Review Board (IRB) reviewed and approved your new study until 09/25/2015.

In accordance with the requirements for research activities that present no more than minimal risk to

subjects set forth in 45 CFR 46.110 the study referenced above qualified for expedited review under the

following research category:

Category 5: Research involving materials (data, documents, records, or specimens) that have been

collected, or will be collected solely for nonresearch purposes (such as medical treatment or diagnosis)

Approved/Accepted Materials:

Title Version Number Version Date Outcome

Transfer Data Sheet Version 1.2 09/30/2014 Approved

In accordance with 45CFR 46.116 the requirement to obtain informed consent was waived by the IRB

based on the following determinations:

- (1) The research involves no more than minimal risk to the subjects;
- (2) The waiver or alteration will not adversely affect the rights and welfare of the subjects;
- (3) The research could not practically be carried out without the waiver or alternation;
- (4) Whenever appropriate, the subjects will be provided with additional pertinent information after participation.

The requirement that written Privacy Rule authorization be obtained from study participants was

waived.

Approval Notice

Institutional Review Board

Kaiser Permanente Southern California

Cc

Area Research Chairperson Pharmacy Services Director Academic Affairs

The KPSC Principal Investigator (PI) is required to:

- Review the document entitled HIPAA Privacy Rule Instructions for Researchers.
- Submit a complete progress or final report of research activities.

And if applicable,

- Submit for IRB review modifications to the research and/or IRB approved research documents.
- Submit Adverse Event report(s) according to IRB policies and procedures and consistent with federal regulations.
- Submit Protocol Violation report(s) and other Unanticipated Problem Reports according to IRB policies and procedures and consistent with federal regulations.

Sincerely,

Signature applied by Armida Ayala on

10/06/2014 12:08:02 PM PDT

Armida Ayala, MHA, PhD

Director

Human Research Subjects Protection Office

Institutional Review Board

Appendix C

Fresno State IRB Approval Letter

California State University,

Fresno School of Nursing
IRB Approval

Date: November 14, 2014

RE: DNP-1425 Outcome Analysis and Quality Improvement for Inter-Hospital Transfers Of Pediatric Patients.

Dear Carma Tobiassen,

As the Chair of the Department of Nursing Research Committee, serving as the Institutional Review Board for the Department of Nursing, I have reviewed and approved your review request for the above-referenced project for a period of 12 months. I have determined your study to meet the criteria for Minimal Risk IRB review.

Under the Policy and Procedures for Research with Human Subjects at California State University, Fresno, your proposal meets minimal risk criteria according to section 3.3.7: Research in which the risks of harm anticipated are not greater, probability and magnitude, than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests.

The Research Committee may periodically wish to assess the adequacy of research process. If, in the course of the study, you consider making any changes in the protocol or consent form, you must forward this information to the Research Committee prior to implementation unless the change is necessary to eliminate an apparent immediate hazard to the research participant(s).

This study expires: November 14, 2015

The Research Committee is authorized to periodically assess the adequacy of the consent and research process. All problems having to do with subject safety must be reported to the Research Committee. Please maintain proper data control and confidentiality.

If you have any questions, please contact me through the CSU, Fresno School of Nursing Research Committee at tereag@csufresno.edu.

Sincerely,
Terea Giannetta, DNP
School of Nursing, Research Committee, Chair