Long Term Care Improvement at Oriol Health Care

A Major Qualifying Project Proposal
Submitted to the faculty of
WORCESTER POLYTECHNIC INSTITUTE
in partial fulfillment of the requirements for the
Degree in Bachelor of Science

By:
Devan Beaulac, IE
Joseph Giambarresi, IE
Richard Hinrichs, IE
Michelle Mulkern, STP

Submitted on March 26, 2015

Project Advisors: Sharon Johnson, Professor, School of Business
Kent Rissmiller, Professor, Social Science and Policy Studies
Sponsoring Agency: Oriol Health Care

Abstract

Oriol Health Care's Wachusett Respiratory Care Unit is a 41-bed skilled nursing unit that cares for patients requiring ventilators. The goal of this project was to analyze the frequency and cause of patient hospitalizations, investigate root causes to improve care, and make recommendations to reduce hospital admissions. Utilizing the A3 problem solving methodology, the team reviewed causes for hospital transfers, created process maps, and formulated recommendations for reducing admissions. These recommendations include improving inter-facility communications and adding electronic patient monitoring.

Acknowledgements

We would like to thank everyone at Oriol Health Care for their infinite willingness to provide us with information and help us understand the operations of the facility. We would especially like to thank Robert Oriol, CEO, and Dawn Auger, Director of Nursing, for their commitment to this project and ensuring we received all of the information we needed to make the most effective recommendations.

We would also like to thank our advisors, Sharon Johnson, Associate Professor in the School of Business, and Kent Rissmiller, Associate Professor in the Social Science and Policy Studies Department, for their continuous support and direction throughout the entirety of the project.

Table of Contents

Table of Figures

Table of Tables

Authorship

This section describes the leadership roles each team member assumed during the project, with each explained in the context of the author's major. Areas of responsibility were assigned to match the skills expected of a graduate with his or her degree.

Industrial Engineering: The purpose of the industrial engineering degree is to build the skills necessary to effectively consider how engineering and technology, management, business, and people fit into solutions designed for process improvement.

> *Devan Beaulac*: Devan handled a majority of the work involving the research and design implementation of the eICU, as well as research related to communications in healthcare. She also gathered information to create Oriol's current state process maps.
>
> *Joseph Giambarresi*: Joseph primarily investigated the care process as it applies to the cost on the healthcare system. He also researched hospital readmission data in the healthcare industry.
>
> *Richard Hinrichs*: Richard worked with the rest of the team to collect and analyze progress notes to determine causes for hospital admissions. He also used Oriol's medical records system to track total hospital transfer data for multiple years and organize it so we could answer research questions related to the goal of the project.

Society, Technology, and Policy: The purpose of the Society, Technology, and Policy degree is to evaluate the process of existing policies, both public and private, and to help formulate new policies to address social needs. It particularly focuses on the relationship between technology, society, government, and business in several areas of policy; this particular graduate has specialized their program to focus on Health Policy.

> *Michelle Mulkern*: Michelle researched the current scope of responsibility and limitations for Oriol Health Care, which helped the team make realistic and implementable recommendations for the facility. She also investigated the policies and procedures related to Oriol's patient care, relevant medical information, and the communication structures in place between hospitals and Oriol.

1.0 Introduction

Respiratory failure encompasses a broad range of medical complications that hinder lung function. This creates a population of medically vulnerable patients who need more specialized care specific to their respiratory ailments. Conditions like Amyotrophic Lateral Sclerosis (ALS), Muscular Sclerosis and Dystrophy, Chronic Obstructive Pulmonary Disease (COPD), and Spinal Cord Trauma all may decrease lung functionality. Patients with these medical conditions often experience deteriorating health over time; eventually, their condition may be too complex to live independently, but stable enough not to be in an urgent care unit in the hospital.

Oriol Health Care is a comprehensive nursing center that cares for these respiratory-compromised patients who require long-term ventilation in the specialized Wachusett Respiratory Care Unit. Their staff believes in personalized patient care and is committed to providing an enriched and active environment for their residents. When a patient experiences medical complications that Oriol cannot treat, Oriol is forced to admit that patient to the hospital after performing all the medical interventions in their capacity. Therefore, hospital admissions for the 40 patients in the unit are of the utmost concern for Oriol Health Care. If a hospital admission occurs within 30 days of a discharge, it is considered a readmission by Medicare, MassHealth, and Oriol's standards (Readmissions, 2014). Although they have taken preventative measures to reduce the frequency of hospital admission, Oriol still sends patients with acute respiratory distress episodes to the Emergency Department more often than they believe is acceptable. Hospital admissions cause undue stress to the patient, place a strain on the facility, and cost the patient and healthcare system more money.

The purpose of this project was to evaluate the rate of admissions and readmissions to the hospital for the ventilator patients at Oriol Health Care as well as to understand the process to create potential solutions to decrease hospital admissions. The group also determined the causes and financial implications of the hospital admissions, and therefore evaluated new opportunities for improvement to reduce hospital stays. The

project also evaluated the cost structures and regulations surrounding skilled nursing care facilities.

To effectively organize the project and understand the causes and rate of admissions from the Wachusett Unit, the team utilized an A3 problem solving approach to lean thinking. The first step in the A3 process is identifying the problem or need, followed by targeting the current state of the process that needs to be improved. A root cause analysis is then performed to find out why the problem is occurring. Once the root cause is identified, solutions to the problem are evaluated. An implementation plan is created to outline how the problem will be solved and what the target state will be as a result of the solution implementation. The last steps in the A3 process are confirming the implementation of the solution and making sure it achieved the target state (Steps of the A3).

First, the team determined the frequency of hospital admissions at Oriol and other relevant variables, then identified if an increase in the admission of the chronic ventilator patients from recent years had occurred and what the rate of increase has been. Evaluating health care policy and regulation surrounding the legal constraints and responsibilities of the skilled nursing care facility also allowed the group to see if Oriol Health Care is prevented from administering a specific type of intervention to the patient, which could prevent the readmission to the hospital. In addition, the team looked at the preventative care measures taken by Oriol. The group also analyzed the process and cost structures of ventilator patient care. This research and process analysis allowed us to provide recommendations for ways to potentially reduce hospital readmissions and potentially the cost to the healthcare system.

The report is organized, as mentioned in the preceding paragraphs, following an A3 problem solving method. Therefore, the report is organized in this paper as follows: Background research is presented in Chapter 2, Methodology is presented in Chapter 3, Initial State and the analysis thereof is located in Chapter 4, the potential Future State of the facility is presented in Chapter 5, and the conclusions and recommendations are located in Chapter 6. Following Chapter 6 are the references and appendices.

2.0 Background and Literature Review

There is complexity surrounding Oriol Health Care's goal to reduce hospital admissions, as the process of hospital readmission, the cost structure of insurance, and the respiratory technologies for ventilator patients are intertwined. Therefore, an extensive background in all areas of this multifaceted problem was necessary in order to fundamentally understand the root cause. The first part of this chapter explains different types of medical conditions that the Oriol Wachusett patients have, and how these conditions can cause respiratory failure. The team also researched the types of ventilators that are used to treat patients afflicted with chronic respiratory difficulties. The next section provides an overview of the different types of nursing facilities that care for these patients and their skill levels. Information regarding hospital readmissions and a detailed explanation of Oriol's Wachusett Respiratory Unit's procedures for caring for their patients is then presented. In the conclusion section, a comparison of Oriol Health Care to other long-term care facilities in Massachusetts is made, along with a description of additional technology that could be implemented in the Wachusett Unit.

2.1 Chronic Ventilator Patients

Chronic ventilator patients are people with medical conditions that have caused chronic respiratory failure, which is when the respiratory system can no longer manage one or both of its functions, oxygenation and carbon dioxide elimination. When respiring, the lungs complete two major processes: oxygenation, which is the transfer of oxygen across the alveolus of the lungs and the transport of oxygen to bodily tissues; and carbon dioxide elimination, which is the removal of carbon dioxide from blood into the alveolus and exhaled (Kaynar, 2014). The patient's respiratory system can then be supplemented with ventilators, which are discussed in section 2.1.2. The ventilators are categorized into two categories, invasive and non-invasive. The medical conditions that are causing respiratory failure in the Wachusett Unit patients are specifically discussed in the section 4.1.2, where the team explored the different subpopulations of patients in the Unit.

2.1.1 Types of Respiratory Failure

Respiratory failure can be further broken down into two categories, Type I and II. Table 1 compares these two categories. Type I (hypoxemic respiratory failure) is more common and is typically associated with diseases of the lung; this is when the alveolar units of the lung collapse, which results in the lung filling with fluid. Type I respiratory failure is defined by the arterial oxygen tension being lower than 60 mm Hg or a low arterial carbon dioxide tension. This means that patients who suffer from this type of failure have an insufficient amount of oxygen in their blood and can have carbon dioxide levels that are near normal. This condition can be found in pneumonia patients, as well as those suffering from a pulmonary hemorrhage or a pulmonary edema (Kaynar, 2014).

Type II failure (Hypercapnia respiratory failure) is defined by a higher carbon dioxide level greater than 50 mm Hg. These patients may suffer from Chronic Obstructive Pulmonary Disease (COPD), neuromuscular disease, a drug overdose, chest wall abnormalities, and severe airway disorders (Kaynar, 2014).

Table 1: Type I & II Respiratory Failure

Type I Respiratory Failure	Type II Respiratory Failure
Pneumonia patients	COPD
Pulmonary hemorrhage	Neuromuscular disease
Pulmonary edema	Drug overdose
	Severe airway disorders
	Chest wall abnormalities

Respiratory failure can also be classified into acute and chronic, regardless of whether it is Type 1 or Type 2. Table 2 compares the causes for both classifications. Chronic patients can suffer from ventilator or oxygenation issues, with typical causes such as neuromuscular diseases and pulmonary fibrosis. Other causes can be injury related, so any damage to the brain and spinal cord could negatively affect the process. The brain controls the messages to the lungs; even those who suffer from a stroke are at risk for respiratory failure if the stroke affects particular areas of the brain. Chemical inhalation may also cause acute respiratory failure; smoke, fumes and chemicals are toxic

to the lungs. The combination of some causes for example, COPD and a case of pneumonia, can result in death; this combination is the third main cause for death in the United States today. Diseases that affect the muscle function often lead to the need of ventilation (Kaynar, 2014).

Table 2: Acute v. Chronic Respiratory Failure

Acute Respiratory Failure	Chronic Respiratory Failure
Neuromuscular diseases	Chemical inhalation (smoke, fumes)
Pulmonary fibrosis	COPD
Spinal cord, Brain, or lung injuries	Pneumonia
Stroke	

The needs of these patients vary depending on their disease, but the prevention of progression or illness is very important in their care. The process of ventilation maintains the balance between the oxygen and carbon dioxide exchange in patients where oxygen levels are all normalized but who still have high carbon dioxide levels. Ventilator care is advancing; some are being developed with improved monitoring systems. Machines are also becoming smaller and more portable, as well as quieter (Melanson).

2.1.2 Types of Chronic ventilators

The patients in Oriol's ventilator unit rely on ventilator equipment every day. Ventilators come in different types and sizes; mechanical ventilators are machinery that helps with respiration. The different types of ventilators can be divided into non-invasive and invasive ventilators. Non-invasive ventilators allow patients to breathe with signals from the patient or the machine; they are commonly used for patients that are going through a short-term therapy, rather than those who have the long-term condition.

Non-invasive ventilators include: volume-cycled, pressure-cycled, flow-cycled, time-cycled, continuous positive airway pressure ventilators, and bi-level airway pressure ventilators (Covidien, 2014). A volume-cycled ventilator will deliver a consistent amount of air or gas and allows passive exhalation, which is ideal for patients with acute respiratory issues. Pressure-cycled ventilators help deliver oxygen at a consistent pressure and allow passive exhalation. This type of ventilator decreases the risk of lung damage

and is commonly used in short-term therapy; they are used frequently within critical care facilities. A flow-cycled ventilator will give patients oxygen until a goal rate of flow is achieved for inhalation. The time-cycled ventilator will deliver oxygen to a patient over a specific time period, but this type is not commonly used. Continuous positive airway pressure (CPAP) ventilators make patients work against resistance and increase the work to breathe. This machine offers a continuous flow of air with the same level of pressure while exhaling and inhaling. These ventilators will help with inhalation during sleeping (Covidien, 2014). Bi-level positive airway pressure ventilators will deliver air at two different pressures for inhaling and exhaling. This machine will offer nasal and facial masks for the use.

Invasive ventilators feed air through a tube that can be inserted into a patient's nose, mouth, or throat. These types of ventilators deliver air on a time cycle. These types of ventilators control the amount of breaths that a patient takes per minute and are used for patients who may not recover the ability to breathe (Covidien, 2014). Invasive ventilation units have varying technologies depending on the companies that manufacture the equipment. Mechanical ventilator units are used for invasive ventilation. This type of ventilation is what is used at the Oriol facility. Invasive ventilation will redistribute the blood flow from respiratory muscles to vital organs. The ventilator then can then be set to appropriate settings to determine how and when the ventilator initiates the breath for the patient. The modes are generally separated into many different types such as assist-control, synchronized intermittent, mandatory ventilation, and pressure support ventilation (Singer, 2009).

2.2 Care for Chronic Ventilator Patients

Patients who have a need for chronic ventilation, as mentioned above, are typically taken care of by medical professionals in a nursing home setting depending on the severity of their condition. There are various types of care facilities in Massachusetts that serve adults requiring constant medical care. Although they have similarities, there are distinct differences between them, which are important to identify in order to have a fundamental understanding of the scope of patient care that Oriol can provide to its

residents. To address the hospital admission problem, we must begin with how Oriol Health Care is legally bound to uphold particular responsibilities and is constricted by certain limitations based upon the type of care facility.

2.2.1 Residential Care Facilities

A residential care facility, or a "rest home", develops personalized care plans with individuals who do not require routine extensive medical care. Clients of the residential home participate in social and recreational activities under 24-hour supervision, and receive assistance with routine day-to-day activities such as eating, bathing, and moving around the facility. Since no nursing care beyond medication administration is needed, a residential care facility will be staffed by CNAs 24x7, with eight hours of nursing per day by a LPN, and CPR-certified "aides" who supervise and interact with the residents.

These particular facilities must be licensed, and are routinely regulated by the Massachusetts Department of Public Health, specifically the Division of Health Care Quality. Public assistance through the Supplemental Security Income (SSI) program and Emergency Aid to Elderly, Disabled and Children (EAEDC) is available at some residential care facilities for individuals who cannot afford to pay for their care privately and who meet financial eligibility requirements. The Department of Transitional Assistance administers EAEDC. In addition, some long-term care insurance policies may pay for residential care. (SNF Care, 2014)

2.2.2 Nursing, Skilled Nursing, and Rehabilitation Centers

Another facet of nursing care encompasses most facilities that provide 24-hour medical care and supervision to medically compromised adults, including traditional "nursing homes", skilled nursing facilities (such as Oriol Health Care), and rehabilitation facilities. These facilities work with the individual to meet their specialized nursing needs, such as specialized medical interventions or physical therapy. Many facilities have built treatment facilities around the care of a particular ailment; for example, Oriol Health Care has the Wachusett Unit of their facility for patients on chronic ventilation. Other nursing homes may have a robust dementia program or an oncology wing. These facilities may also offer both short term and long-term care, and are frequently staffed

with a variety of medically trained professionals. Most often, CNA's, LPN's, and RN's provide care to many patients. The facility may also opt to have a Medical Doctor or Nurse Practitioner visit several times a week or be on the staff full-time. (SNF Care, 2014). Some facilities may also have specialized medical professionals come in for specific treatment; for example, the Wachusett Unit is visited by a Respiratory Therapist and Pulmonologist several times a week.

2.2.3 Long Term Care Hospitals

Long Term Care Hospitals (LTCH) have the ability to provide hospital-level care for people with chronic and complicated medical conditions for extended periods. The main difference between an LTCH and a skilled nursing center is the average length of a patient stay. A LTCH must also meet Medicare's standards of an acute care hospital. By Medicare standards, a LTCH focuses on patients who need to stay for more than 25 days (What Are Long Term Care Hospitals, 2014).

2.2.4 Payment to Nursing Facilities through Medicare/aid

In Massachusetts, the average daily stay in a nursing facility costs $346, one of the highest in the nation. In addition, some specialized facilities may charge another fee on top of the daily rate for added interventions in the unit. This amount is an extraordinary cost for patients and the insurance companies when patients can no longer independently support the cost of care. Patients pay through a combination of private insurance, MassHealth or (Medicaid) and Medicare depending on their financial needs. Insurance, including Medicare, will pay for medical or physical rehabilitative admissions, usually 20 to 40 days depending on the length of the rehabilitative need. Medicare has a maximum of 100 days, which is seldom approved. MassHealth/Medicaid is used when insurance/Medicare stops paying and does require the person (in general) to have depleted their personal funds (How to Pay).

Medicare is a federally funded insurance program under Title XVIII of the 1965 Social Security Act, and is technically titled the "Health Insurance for the Aged and Disabled". It was established in order to help supplement insurance for the disabled, the retired, and veterans. Medicare consists of Parts A, called Hospital Insurance, and Part B,

called Supplementary Medical Insurance. In 2004, another section of Medicare was signed into law as Medicare Part D, which covers prescription drug costs. People who are over 65 are automatically enrolled in at least the Medicare Part A plan. When Medicare first began enrolling the elderly in 1966, there were only 4 million participants. Now, between Medicare Parts A, B, and D, there are over 42 million people enrolled. (Medicare, 2004).

Medicare Part A generally covers skilled nursing facility stays under certain conditions. Specifically, Medicare Part A will cover the stay if they are in an inpatient program for more than 3 days at a facility that has been registered as an acute hospital with Medicare. Coverage under Part A also includes laboratory tests, meals, semi-private rooms, and rehabilitation services. However, Medicare Part A will only cover these services, with copay after the 20th day, for 100 days, and no longer. Medicare Part B will pay for a "bed hold" in some instances where patients are admitted from the nursing home to the hospital for an acute episode. (SNF Care, 2014)

This insurance payment becomes complicated when patients are readmitted to the hospital from the Wachusett Unit. Even though Medicare does cover most of the cost, they are billed by hospitals and skilled nursing facilities for the interventions and services given to the patient. This means that every time a patient is admitted into the hospital, Medicare is charged for all of the services the patient gets in the hospital on top of MassHealth/Medicare charged by the skilled nursing facility for holding their bed in the interim. (Medicare, 2004)

2.2.5 Interfacility Communication Structures

The United States is filled with private hospitals and medical care facilities that are not directly linked together. Patients move through different systems and are transferred between facilities based on needs; often, information can be trapped within facilities and not communicated to another provider when a patient moves. While many patients' medical conditions are straightforward and therefore the patients can be transferred and treated with ease, some patients are so medically compromised that every piece of information becomes important in order to properly treat them. Documentation and interfacility communication is a subject that receives little attention from medical

professionals; some believe the lack of financial benefits and quality standards are some of the reasons for this lack of emphasis (Naylor, 2009). Medical professionals may also be concerned about violating HIPAA (Health Insurance Portability and Accountability Act), which protects patient's medical information and privacy. Reasons for failures in transitions can include poor communication between professionals, the incomplete transfer of information, inadequate education of family caregivers, limited access to essential services and the absence of a responsible caregiver across all transitions (Naylor, 2009).

Naylor's article pointed out the importance of transition and relied on research mostly from transitions from the hospital to homes, then noted the need for more research on the transitions from skilled nursing facilities to hospitals. They documented that the percentage of hospitalized Medicare patients who were referred to a skilled nursing facility from the hospital rose significantly from 37.4% to 46% within 13 years. The hospitalization rate among the nursing home residents at 30 days increased by 50% within the years 2000 to 2004 according to Stephen Jencks, MD. (Naylor, 2009)

Because of the structure of the insurance industry, including Medicare and MassHealth, it is common that providers in different health care systems remain separate from each other in terms of care planning. The system does not focus on the transitional care, which creates barriers for delivering better care. Workers within the system (nurses, doctors, and social workers) do not get reimbursed for coordinating care. The benefits are given to the hospitals that are providing care, which generates revenue; this results in the system being flooded with frequent transitions (Naylor).

2.3 Hospital Readmissions

A hospital "admission" is define as admission to a hospital for a medical problem; hospital "readmission" is defined as re-entering a hospital or emergency room for the same medical problem within thirty days of being originally discharged. A readmission is billed and categorized differently than a regular hospital admission, as it implies that the original medical problem was not correctly treated the first time. It has become an

expensive problem in the U.S. and begs several questions: Was the care provided up to standard? Who is responsible for this? How can this type of problem be mitigated?

Most hospitals are paid a lump sum per admission based on the Diagnostic Related Group, DRG, of the patient. However, since 2012, CMS has implemented a Readmissions Reduction Program. This program seeks to find the underlying causes of readmission, determine the rate of readmission and ensure that hospitals that have many readmissions, or more than the national average, have a payment adjustment for their faulty care. As of now, these standards for Hospital Readmission apply to patients that fit certain criteria. Some of the illnesses that are tracked are Acute Myocardial Infarction, Heart Failure, and Pneumonia (Readmissions, 2014).

A report from the Robert Wood Johnson Foundation found that hospitals did not make significant improvements in their readmission rates from 2008-2010. Doctors, patients, and nurses were interviewed to try to establish why this was happening. "New Medicare data from the *Dartmouth Atlas Project* shows that patients' chances of being readmitted largely depend on where they live and the hospitals where they receive care" (Dartmouth, 2014). Where a patient lives and where they go to receive care is not a factor that can be controlled. A method that can be controlled and help readmission rates is chronic disease management. Hospital stays are frequently inflated by unnecessary or duplicate testing, poor coordination among various specialties or specialists, hospital-acquired infections, long waiting periods for laboratory and diagnostic results and the high cost of medical devices, drugs, and other services. Some patients are readmitted for complications that are avoidable:

> One in eight Medicare patients were readmitted to the hospital within 30 days of being released after surgery in 2010, while one in six patients returned to the hospital within a month of leaving the hospital after receiving medical care. Patients were not significantly less likely to be readmitted in 2010 than in 2008. (Dartmouth, 2014)

Often times a readmission is a planned part of a patient's care, but others can be completely averted and are due to things like the availability and effectiveness of local

primary care, discharge planning, differences in patient health status and the threshold for readmission in that area (Dartmouth, 2014).

Just this year, Medicare fined a record number or hospitals for their readmission rates at 2,610 hospitals. Almost 40 of these received the highest fine possible. This means that the hospitals received less funding from Medicare for their poor performance:

> Last year, nearly 18 percent of Medicare patients who had been hospitalized were readmitted within a month. While that is lower than past years, roughly 2 million patients return a year, costing Medicare $26 billion. Officials estimate $17 billion of that comes from potentially avoidable readmissions. (Rau, 2014)

Three out of four hospitals that are subject to the Readmission Reduction Program received fines this year. Medicare estimates that these fines will top $400 million. These fines should urge hospitals to look internally and find out why their rates have been so high, and what they can do to reduce them. Many hospitals are looking at their cursory discharge instructions and defining them more explicitly with something the patient can bring home. Others are encouraging that outside doctors supervise patient recovery and administer medications that a patient may not be able to pay for (Rau, 2014).

2.4 Oriol's Wachusett Respiratory Care Unit

Oriol's advanced respiratory care unit takes numerous precautions to ensure patients are staying as healthy as possible. Since ventilator patients require more care, Oriol averages seven hours of patient care per day, compared to roughly three and a half for a typical nursing facility. Oriol's nurses are trained specifically to care for respiratory patients through extensive training specific to the Wachusett Unit. In addition, there is a pulmonologist and several respiratory therapists who visit weekly.

To have some frame of understanding on the infection control policies of the Wachusett Unit, the nursing director provided a "housekeeping" round list used by the floor nurses which outlines the monthly procedures that should be done with the patients. For example, toothbrushes are changed monthly to prevent oral infections, patients are

moved and stimulated each day to prevent bed sores, and suction tubes are changed weekly. Some of the preventative measures are outlined in Table 3 below.

Table 3: Preventative Care Measures

Frequency	**Preventative Measure**
24 Hours	Change Foley Irrigation
	Change Inner Cannula
	Tracheal Sponge Replacement
	Tracheal Collar Replacement
48 Hours	Change Ballard
Weekly	Change Yankauer Suction
	Change Suction Connection Tubing
	Change Foley Bag
	Change Nebulizer Setup
	Change GT Plug
	Change Vent Tubing/Filters
	Clean Concentrator Filter
	Change Mist Bottle and Machine Filter
	Change O2 Mask Nasal Cannula
	Clean O2 Humidification bottle
Monthly	Change Bedpan/Urinal
	Change suction bottle and filter
	Change grad cylinder

2.5 Other Respiratory Care Facilities

Several other Massachusetts facilities offer some form of respiratory care for patients suffering from respiratory failure. These include Whittier Rehabilitation and Skilled Nursing Center, Hillcrest Nursing and Rehabilitation Center, and Wingate at Worcester. Although most of these facilities offer respiratory care, they focus on weaning patients off ventilators; very few facilities in Massachusetts deal with chronic ventilator patients as Oriol does.

Whittier Health has many facilities throughout Massachusetts and New York. Their rehab hospital in Westborough, MA offers respiratory services to short and long term patients. Their model is different from Oriol's because they have a respiratory therapist(s) on-site at all times to oversee the care of patients. Their ventilator unit is smaller than Oriol's with about 19 beds. According to their website, Whittier accepts Medicare/MassHealth as well as other insurance plans. Whittier also has a skilled nursing facility; which is the same classification as Oriol, in New York that offers long-term care for chronic ventilator patients (Whittier).

Hillcrest Commons Nursing and Rehabilitation Center in Pittsfield, MA also provides ventilator care services. They focus on weaning patients off of ventilators, but do offer long-term care to some patients. Similar to Whittier, Hillcrest also has respiratory therapists on site around the clock (Hillcrest). Wingate at Worcester also has respiratory therapists on site and works hard to wean patients off of ventilators. According to their website, about 50% of their patients have been weaned off of ventilators because of their therapy program (Wingate).

2.6 eICU (electronic Intensive Care Unit)

Technology has transformed the way we live in the past century and is improving service in areas such as health care immensely. Telehealth is a term used to describe the use of remote healthcare. Telemedicine provides tools for increased communication via

electronic communication. There are many different applications of telemedicine including face-to-face videos, emails, smart phones, and other wireless mechanisms. Telemedicine offers services that include consultations between primary care and specialists, as well as remote patient monitoring. Mechanisms can range to fit the needs; there are networked programs that will allow the link between health centers. (What is Telemedicine)

The eICU (electronic Intensive care unit) is a form of telemedicine that uses new technologies to monitor the health of patients as well as provides the ability to directly connect with medical professionals for an extra level of service for patients. This technology is beneficial to patients that may require ICU care or consistent monitoring, where it is of the utmost importance to know the patient's health status and any deviation from their baseline condition. Essentially, eICU is a system of monitors directly connected to the patient which monitor the patient's health condition for a variety of factors, such as vital signs (blood pressure, heart rate, oxygen saturation in the blood), respiratory effort and function, or other parameters relating to the patient's compromised condition. It then alerts an on-call doctor when there is a deviation in the patient's baseline condition so the staff in the ICU can apply early interventions to prevent the condition from worsening. The on call doctor or doctors are usually located in a control center. The medical professionals in the center would be watching the patient's condition continuously.

The first eICU was launched in 2009 with call a center staffed completely by nurses, and so far has promising benefits for both patients and hospitals, which utilize it. Since the launch, eICUs are now staffed with physicians as well as nurses. For example, from the time of the launch in Providence Hospital's Adult Critical Care Unit, the facility noted numerous improvements in the system, including a 15% decrease in average length of stay in the hospital, a 14% decrease in mortality, an 8% increase in compliance with the ventilator standard of care provision, and a 100% improvement in documentation compliance (Haglund).

For patients who are extremely compromised, such as in a critical care unit, this monitoring system can help nurses catch the smallest change in condition and aid the

patient quickly before the condition worsens. The system uses a two-way camera, video monitors, microphones, and alarms that are connected to medical professionals. The eICU monitoring can monitor the respiratory system, which is essential for the patients of Oriol Health Care. Modules available can monitor the respiratory rate, the tidal volume, the minute volume, the positive end-expiratory pressure, peak inspiratory pressure, dynamic compliance, and airway resistance (Haglund).

With the benefits that this offers, some hospitals consider the investment has already proved its worth. The Baptist Health eICU program was recognized in the *Journal Critical Care Medicine* for their 3-year observational study. The study included the records of 24,656 patients; the results showed a 14% decrease in the severity-adjusted length of stay in the hospital, and 13 percent decrease in the length of stay in the ICU and 23 percent decrease in the relative risk of hospital death after tele-ICU implementation as compared to before (Haglund).

The eICU program was also acknowledged by the Wall Street journal as one of the six leading innovations that can have a dramatic impact on healthcare. The program outcomes include a 37-64% decrease in mortality; 8 million dollars in savings that have been attributed to the program (Landro). The eICU has been used in several hospitals throughout the US, and includes a large upfront investment. The system has an estimated cost of 5 million dollars to install; the cost of staffing will bring the annual cost to around 2 million dollars. The program is funded through federal and charitable grants and other private funding. (Rouse)

3.0 Methodology

The purpose of this project was to evaluate the frequency of hospital admissions for ventilator patients at Oriol. In addition, we determined the potential causes and the financial implications of patient admissions in order to create recommendations, which may alleviate some hospital admissions. This project also evaluated the cost structures and state regulations surrounding the skilled nursing care facility. After the team's research and data analysis was completed, opportunities for improvement were recommended to Oriol Health Care. To simplify the methodology of this complex, multi-faceted project, the team used an A3 problem solving method to approach the problem. This includes defining the problem, determining the initial state, finding the root causes of the problem, finding solutions and developing a plan to implement them, as highlighted in the Introduction.

3.1 Problem Statement

The goal of the project is to understand care cycles and related costs for patients within Oriol Health Care's chronic ventilator unit, focused on particular medical conditions or events, and to investigate interventions that might improve quality, patient outcomes, and reduce costs. The facility has taken preventative measures to reduce the frequency of hospital admissions, however, Oriol Health Care still sends patients in the Wachusett Respiratory Care Unit to the Emergency Department more often than they believe is acceptable. The stakeholders include Oriol Health Care, including its employees and patients, area hospital systems that transport and admit Oriol's patients, and insurance companies, including Medicare and MassHealth that pay for the ventilator care.

3.2 Data Collection and Investigation of the Current State

The team collected data from medical records to better understand the characteristics of patients who flow through the health care system between Oriol and the hospital. Our data collection started with gaining preliminary demographic information through meetings at Oriol Health Care. The group also underwent HIPAA training in order to view the medical records of current and past patients under Oriol's care, and also

applied for and received IRB approval to ensure our data collection methods met university standards. Patient's medical records were used to collect information that would help the group identify the cause of the admissions to the hospitals, such as their age, medical background, previous hospital visits, the date they were admitted, and other relevant information. From the records, the group could connect trends related to admission or readmission with the subtype of patients to see if one group of patients with a particular medical diagnoses if getting admitted more frequently.

When examining preliminary data, the group used certain design tools to help analyze the current admission rates. Oriol uses an online system called PointClickCare to handle the medical records for all of the patients in the different units at the facility. We used this system to collect data on the roughly 40 patients in the Wachusett Unit. The first step was to code a list of the patients to ensure no identifying information was collected. We assigned each patient a number that we referenced when we recorded data. We then collected the relevant background information on each patient, such as age, admission date, and diagnosis.

After we created the list of patients that we determined should be part of our analysis, we started looking at the hospital admissions for each of them. To get all of the information leading up to and following the hospital visit, we had to look at each patient's progress notes. We first had to look at each patient's medical record to determine the date for each hospital visit. We then searched the progress notes for the cause. We queried notes for three days before the transfer and two days after they returned in order to find the cause of the transfer and any treatments performed at the hospital that were sometimes recorded upon return.

The team received figures for costs that are involved with the care given in the facility; these figures were evaluated based on the number of patients and the type of insurance they had. These calculations demonstrate how Oriol's income is generated and how some expenses are broken. Financial flows are important to understand because in order to make recommendations, the magnitude of Oriol's income needs to be known to figure what can be allotted for new procedures or equipment. Expressing the cash flows also portrays the cost burden on everyone in the system.

3.3 Determining Root Causes

The team created a fishbone diagram in order to determine the root causes of the perceived increased rate of admission. The diagram included levels of Oriol's operations that may have an effect on the number of emergency transfers that occur. This was accomplished by brainstorming, research into nursing facilities and discussions with Oriol staff members.

3.4 Finding Solutions

From the fishbone diagram, our team could narrow down areas of improvement to research. The team met with the Director of Nursing multiple times to gain feedback on what type of changes they would benefit from. The team used this advice to help navigate areas of research. The main areas of opportunity that were identified were creating an eICU, improving communication systems, and further expanding care in skilled facilities.

Adapted Electronic Intensive Care Unit (eICU)

To learn more about potential digital eICU technologies, the team researched how to install an eICU and how they affected care. Since the installation of an eICU would be costly, the team created a variation that would be more affordable for Oriol. The team hypothesized that monitoring the patient's vitals consistently would allow nurses to catch changes in the patient's condition sooner, therefore allowing quicker treatments before conditions worsen. To determine the types of monitors that might be used, the team contacted the Philips Corporation. Through multiple phone calls, the team was given the contact information of the salesperson for the Massachusetts region. After the team spoke with the sales representative, we learned of the different types of monitors and the best type for the patient subtype at Oriol. The team wanted to consider the cost, functionality, and mobility of monitors when making a decision, so used these criteria to help make appropriate recommendations.

Improving the Interfacility Communication Structure

To improve communication our team investigated the current structures in place, through meetings with the Director of Nursing. The team learned of the current structures and then researched other hospital standards to try to find areas of improvement. The team gathered various documents that Oriol currently uses to communicate the outgoing patient's condition with the doctor that will care for them at the hospital. The team investigated the documents to try to find areas of improvement. The current documents can be found in Appendix C.

Policy Change

Together our group wanted to look into other ways that Oriol Healthcare could improve care given at skilled facilities. The team interviewed the Director of Nursing as well as the CEO to learn that the facility is currently unable to give any medical interventions when their patients deviate from baseline. The team wanted to complete an analysis of why this happens. The team researched the backgrounds of skilled facilities, as well as the Medicare infrastructure to create an understanding of the process.

3.5 Implementation

In order to reach the future state, we needed to create a well-designed implementation plan for Oriol to follow when they act on the recommendations. Our implementation plan includes some of the actions that Oriol needs to take as well as information as to what options are available to them and possible price points. Oriol also needs to be able to track the results of the implementation plan.

4.0 Initial State of Operations and Analysis

In order to make realistic, implementable solutions for the facility, this multi-faceted problem of hospital admissions must be examined in a number of different ways. After defining what the problem is, the team began to examine most aspects of Oriol's current state of operations, called the "Initial State". We examined the medical records system for data on hospital transfers, in addition to the levels and types of medical staffing, medical diagnoses of the patient's, policies surrounding ability to provide care, technology used in the unit, and the cost burden of hospital transfers. All of this was examined in order to determine what areas could be improved in the facility and what areas did not contribute to hospital admissions.

4.1 Initial State within Oriol Health Care

The next step after defining the problem is to determine the initial state. To determine the current state at Oriol we analyzed hospital admissions for their current patients and looked for trends that could point to areas for improvement. Analyzing the current state also involved evaluating the current care process for ventilator patients by creating process maps and understanding staffing in the Wachusett Unit. This section also describes a breakdown of costs associated with caring for ventilator patients and transferring them to the hospital.

4.1.1 Data Analysis and Results:

Oriol uses a system called PointClickCare to handle all medical record electronically. The system was put into use in April 2012, but a full migration from paper to electronic records was not completed until the end of 2012. The team collected two main sets of data to analyze admissions. The first was an in-depth analysis of about 38 patients that were in residence during November 2014. The exact number of patients changed a couple times over the course of our data collection as patients entered and left Oriol's care. The other analysis was of the total number of emergency hospital admissions logged in the electronic system in 2013 and 2014.

After we collected the admissions data for current patients, we looked for trends and common reasons for admissions. We met with Director of Nursing multiple times to

get a better understanding of some of the progress notes to narrow down the reason for the hospital admission. Figure 1 shows the most common admission causes for the 38 patients we analyzed in depth. It does not include any of the causes that had only one occurrence in 2014. This only represents the 38 patients that we analyzed in December, which represents only a portion of the patients and admissions in 2014.

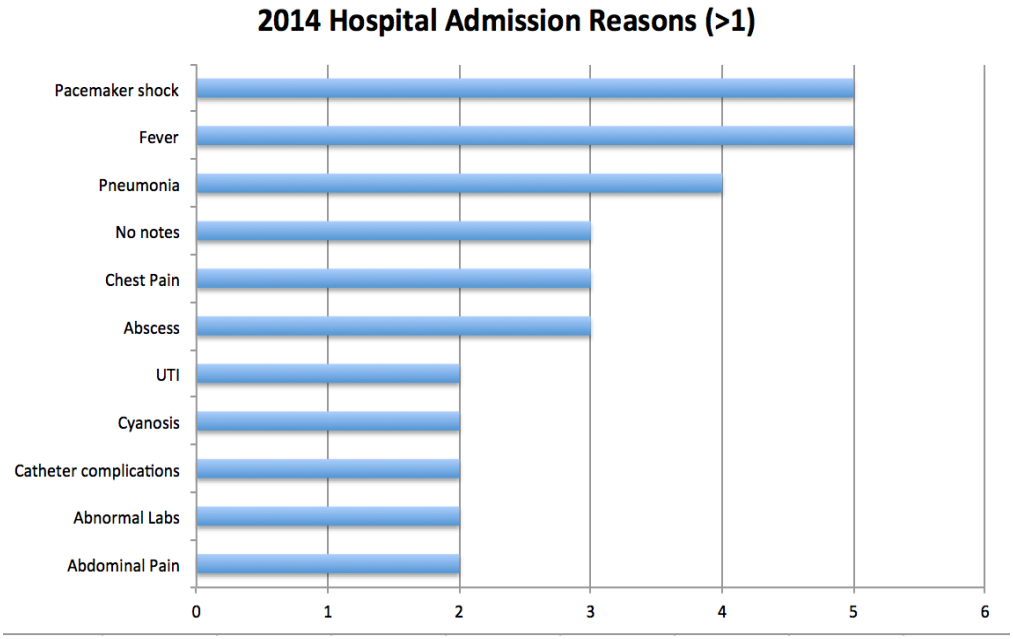


Figure 1: Hospital Admission Reasons

We also looked at the trends in all hospital admissions. To analyze this, we recorded every hospital transfer from the Wachusett Unit in 2013 and 2014 and calculated the totals shown in Table 4 below. The data shows that there was an 11% increase in hospital admissions per paid patient day from 2013 to 2014, as shown in Table 4.

Table 4: Wachusett Unit Admissions Totals

	2013	2014	% Increase
Q 1	28	46	64%
Q 2	47	57	21%
Q 3	39	50	28%
Q 4	31	36	16%
Year Total	145	189	30%
Paid Patient Days	11718	13748	17%
Admissions/ Pd Patient Day	0.0124	0.0137	11%

4.1.2 Patient Subpopulations

During the research process, it was hypothesized that some patients who fall into a particular "sub population" based on their medical diagnoses may have a higher rate of admittance because of their condition. For example, perhaps some patients with a chronic respiratory problem may have more acute respiratory distress episodes than a patient who is in a vegetative state. For this reason, we categorized patients into five different subgroups based on the initial condition that placed them on a respirator.

Out of the 39 patients in the study group, Amyotrophic Lateral Sclerosis (ALS), a cerebrovascular accident (CVA) (commonly referred to as a stroke), and trauma to the brain or spinal cord emerged as the three conditions that affect most patients in the Wachusett Unit. Exact numbers can be seen in Table 5 below. The rest of the patients not affected by these three conditions were categorized into broader categories. Some patients were not able to breathe independently because of multiple conditions that affected the central nervous system (CNS), like an anoxic brain injury from a seizure disorder, or multiple sclerosis. The fifth subpopulation was reserved for patients who did not seem to have enough commonality between them to form a separate, unified subpopulation, and therefore was categorized as "other respiratory failure".

Table 5: Admissions by Subpopulation

Subpopulation	2012	2013	2014	Total	Patients	Admissions/Patient
ALS	4	1	6	11	6	1.8
Brain or Spinal Trauma	3	4	2	9	7	1.3
CNS condition/Injury	1	2	7	10	7	1.4
CVA	2	7	11	20	8	2.5
Other Resp Failure	7	2	21	30	12	2.5

Amyotrophic Lateral Sclerosis, also known as ALS or Lou Gehrig's disease, is a degenerative neurological disease. The underlying cause of the disease is unknown, however, scientists think it has a significant genetic component. In a properly functioning body, the neurons in the brain send signals through the neurons in the spinal cord, which send impulses to the muscles to complete an action. ALS slowly degrades the neuron's ability to send signals from the brain through to the muscles and eventually results in

neuronal death. The ALS association breaks down the name of the disease well, explaining that, A-myo-trophic comes from the Greek language. ‘A’ means no or negative. ‘Myo’ refers to muscle, and ‘Trophic’ means nourishment–No muscle nourishment. When a muscle has no nourishment, it ‘atrophies’ or wastes away. ‘Lateral’ identifies the areas in a person's spinal cord where portions of the nerve cells that signal and control the muscles are located. As this area degenerates, it leads to scarring or hardening ("sclerosis") in the region. (ALS Association).

Patients affected with ALS usually present first with muscle weakness and loss of voluntary control. Patients slowly lose mobility, speech, and swallowing abilities as the disease progresses. Eventually the disease will continue to starve the motor neurons, which will result in respiratory arrest and paralysis. Patients will become unable to move their diaphragm to inhale and exhale, which will permanently place them on a respirator. Most patients have an estimated prognosis of three years after the onset of symptoms until death. However, some patients have been known to survive with the disease for as long as 10 years. Out of the 40 patients in the Wachusett Unit of Oriol Health Care, six of these patients have ALS.

A stroke, also called a cerebrovascular accident or a “brain attack” is a loss of blood flow to the brain (National Stroke Association). There are two types of strokes, hemorrhagic and ischemic. A hemorrhagic stroke is essentially a brain bleed from either a brain aneurysm rupturing or a leaking blood vessel in the brain. They make up only 13% of most stroke cases, but about 40% of the time will result in death. There are two types of hemorrhagic stroke- intracerebral and subarachnoid. An intracerebral hemorrhagic stroke is when a blood vessel in the brain bursts; the accumulating blood then compresses the surrounding tissue and kills brain cells. A subarachnoid hemorrhagic stroke is when a blood vessel bursts and spills blood in the space between the brain and the thin film of tissue covering the brain, called the subarachnoid space. This places an extreme amount of pressure on the brain and stops function-- most commonly, head trauma or an aneurysm causes this type of hemorrhagic stroke.

An ischemic stroke is caused when a blood clot in the body blocks blood flow to the brain. The two types of ischemic strokes are an embolic stroke and a thrombotic

stroke. An embolic stroke is caused by a blood clot that forms elsewhere in the body and travels into the brain, blocking blood flow. A thrombotic stroke is caused by a blood clot in one of the major arteries that feeds into the brain, like the aortic artery. During any kind of stroke, the brain is damaged from a significant lack of oxygen. Patients often do not have a great prognosis for recovery because the neurons in the brain have little capacity for regeneration. Out of the 40 patients in the Wachusett Unit of Oriol Health Care, eight of the patients have had a stroke, which has affected their ability to breathe independently.

An additional seven patients in the Wachusett Unit have had some sort of accident, which damaged their brain or spinal cord (which together make up the Central Nervous System, or CNS). The consequences of CNS damage depend on where the trauma occurred. Minor damage to the CNS may result in numbness of a limb, sensory changes, motor changes, weakness, or paralysis. Unfortunately, in the Wachusett Unit patients, this CNS trauma was so severe that they are completely unable to breathe on their own. The neurons in the central nervous system have limited-to-no regenerative properties so the damage to the patient is usually permanent.

There is a substantial population in the Wachusett Unit that has several medical conditions that explicitly affect the central nervous system. These patients have conditions including encephalopathy, multiple sclerosis, cerebral palsy, and an anoxic brain injury, which resulted in a vegetative state. Seven patients in this Unit were categorized with these central nervous system conditions.

Encephalopathy is a disease of general brain dysfunction that can be caused by a variety of aggressors ("Encephalopathy"). The most common reason for encephalopathy is a viral or bacterial disease that attacks the brain and leaves it permanently compromised. Other forms of encephalopathy can be caused by metabolic dysfunction that prevents the removal of toxins from the body. This syndrome always results in some form of a permanently altered mental status, but can also include muscle loss, involuntary muscle movements, rapid eye movement, and seizures. Depending on the severity of their dysfunction, patients may or may not be able to talk, move, or live independently. The patients in the Wachusett Unit have unfortunately had the encephalopathy affect their

cognitive function in such a way that they cannot breathe without assistance. Two patients in the Unit have encephalopathy.

An additional two patients are affected by Multiple Sclerosis (MS). This is an autoimmune disease of the central nervous system. It attacks the myelin sheath around the neurons in the CNS, which physically propels the signals from the brain down through to the body. The degradation of this myelin sheath prevents the CNS from communicating with the body, which results in muscle loss and disability (Multiple Sclerosis Society).

Cerebral palsy is a neurological disorder that appears at birth or in childhood and affects the ability of the brain to control muscle movements (Cerebral Palsy Alliance). This disease is different from ALS or MS in that there is nothing wrong with the nerves or the muscles, but rather in the cerebellum of the brain. Cerebral palsy does not typically worsen exponentially but rather slowly gets worse with age, so patients with cerebral palsy can live a relatively long life. Only one patient in the facility has cerebral palsy.

The last two patients in this broad group are now in a vegetative state because of an anoxic brain injury. An anoxic brain injury is one that results in a cognitive deficit from a lack of oxygen, resulting in a vegetative state. Sometimes this can be the result of a prolonged seizure that shuts off oxygen flow to the brain, or complications from birth.

The final category created included patients who do not seem to fall into one particular type of category of diseases or medical conditions. The patients have diseases that are extremely varied, such as COPD, obesity, lung cancer, muscular dystrophy, or polio. Only a couple of patients have these types of illnesses, and the medical prognosis is wildly different for each person. We placed 12 patients with various medical conditions into this category because unfortunately there is no real connective thread between these patients.

4.1.3 Current State of Operations

After looking at the data we were able evaluate the current state of the Wachusett Unit. We first looked at the staffing levels for the different types of employees. We then looked at the current care process and response to medical complications. We then evaluated the current monitoring systems in place for tracking patient health.

Staffing Levels

The team worked with the Nursing Director to create a more in-depth understanding of the types of professionals that work within the Wachusett Unit. The group has collected the types and amount of professional staff on all of the shifts within the building. The team used this knowledge, as well as patient's departure time from the facility, to explore possible correlations. It will be beneficial to Oriol to identify if any particular shift is facing more hospital admissions than others are. The different types of medical professionals, and the amount of each type per shift, are broken down in Table 6.

Table 6: Staffing Levels

Personnel Staffing Levels Per Shift					
0700-1500		1500-2300		2300-0700	
Program Manager	1	Charge Nurse	1	Charge Nurse	1
Unit Manager	1	Licensed RN and LPN's	6	Licensed RN and LPN's	4
On-Call MD for Unit	1	Certified Nursing Assist	6	Certified Nursing Assist	4
Pulmonologist	1				
Respiratory Therapist	1				
Nurse Practitioner's	3				
Licensed RN and LPN's	6				
Certified Nursing Assist	6				

The Program and Unit Managers for the facility are administrators who oversee day-to-day operations of the Wachusett Unit. There are three medical directors for the facility: one for long-term care, one for short-term care, and one specifically for the Wachusett Unit. Each Medical Director is responsible for their own patients, and is available for evaluation of a patient if an issue arises with another doctor's patient. In addition, Oriol Health Care has brought in several other advanced medical practitioners, such as a respiratory therapist, pulmonologist, and nurse practitioners (NP's) in order to give more individualized care, in addition to the on-call Medical Doctors (MD's).

A pulmonologist is a MD who specialized in internal medicine, followed by a fellowship specifically in pulmonology, who works at Oriol full time. A pulmonologist works to develop long-term health care plans with the patient's other primary care

doctors, but exclusively for the patient's respiratory problems. A pulmonologist consultant group comes in weekly to assess patient's care plans, in addition to the pulmonologist who is employed full time.

A respiratory therapist is at the facility for the Wachusett Unit full time; this is a specialized health provider who passes a national board examination, and provides physical therapy under the supervision of a medical doctor. Nurse Practitioners, also known as advanced practice nurses, are the primary providers for the patients in Oriol. Often, all four of these providers work together as a team to develop long-term health management and goals for the patients of the Wachusett Unit.

The three Nurse Practitioners are in the facility five days a week for six to eight hours a day. A nurse practitioner (NP) is an advanced practice registered nurse (APRN) who has completed advanced coursework and clinical education beyond that required of the generalist registered nurse (RN) role. An RN, LPN, and CNA all have varying responsibilities and capabilities in the field of nursing.

Care Process

The current care process describes the transfer of patients in and out of the Wachusett Unit when health issues arise. The patient's deviation from baseline will first be noticed by the nurses and then, depending on the urgency of the issue, the patient will be transferred to the emergency room immediately or the nurse will contact the on-call doctor for further evaluation. The MD will then order additional tests for the patient, then makes the decision to send the patient to the ER or keep them within the facility depending on the results and the interventions that Oriol is allowed to provide to remediate the health problem. The ambulance then transfers the patient to the Emergency Department. Depending on the type of insurance the patient has, a bed-hold may be put in place to reserve their spot in the Unit when they leave the facility. Once the patient is in the emergency room, he or she is either admitted for a several-day hospital stay, or sent back within 24 hours to Oriol's care after an evaluation and establishment of a treatment plan. The process map is shown in Figure 2.

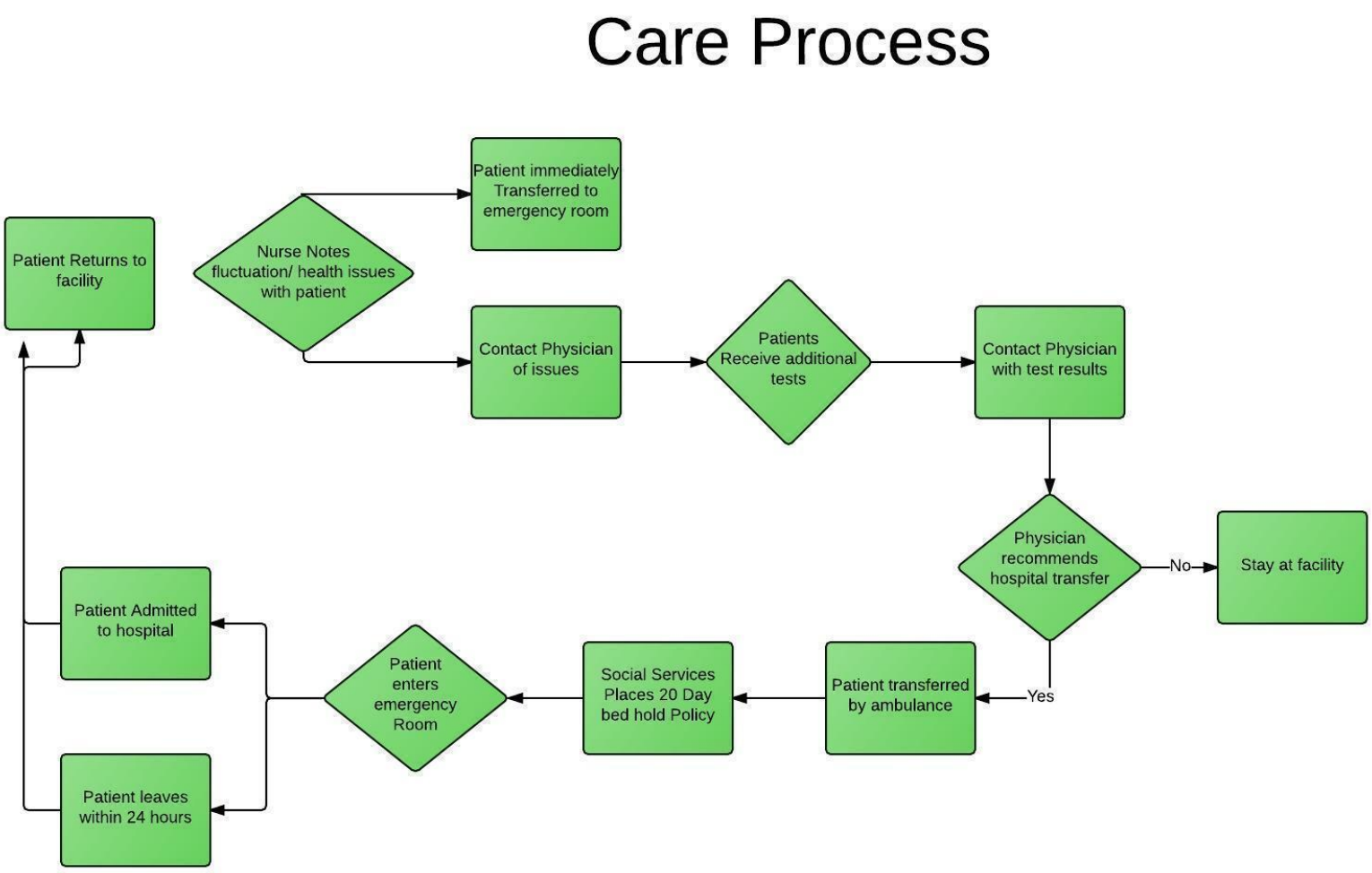


Figure 2: Current Care Process Map

Current Ventilators and Monitors in Patient Room's

Currently Oriol's patients in the Wachusett Unit are connected to ventilators which assist in breathing for most of the day, depending on their breathing needs. Some patients are mobile and have ventilators that allow them to ambulate freely. Adversely, some patients are immobile and bed-ridden, and therefore are on more cumbersome ventilator machines. Patients' vitals are monitored manually once a shift by a CNA, LPN, or RN, rather than being electronically monitored through the day by a monitoring machine or through the ventilator, such as a constant pulse oximeter or EKG machine.

4.1.4 Current Cost Structures

Oriol Health Care provides top quality care to their patients. In the Wachusett Unit especially, this care requires around the clock service. The ventilator patients consume many resources and often their health deteriorates more quickly than the more usual nursing home patients. Because of this, the care given to them is very expensive. This section will define the cost structures used by Oriol.

Just about every service to take care of their patients is covered by Oriol. Medicare pays Oriol $700/day for each patient it admits. This income is their main source of revenue. Treatments, medications and consumable supplies are all paid for with this income. Medicare pays for the first 100 days of payment, then MassHealth pays $600/day/patient. While staying in the Wachusett Unit, many costs arise including: oxygen, tube feeding, advanced staffing and consumable vent supplies. When a patient experiences respiratory distress or any other emergency, he or she is transported to the hospital. This transportation costs Oriol $500 each way. Medicare covers the trip to the hospital but not the return trip to Oriol. Mass Health (the Massachusetts MassHealth program) will cover transportation both to and from the hospital, as well as $2,000 worth of medications/month. Oriol absorbs any additional cost. If the trip to the ER extends to longer than one day, MassHealth will hold the patient's spot at Oriol by paying $80 per day. This hold can last up to 20 days. If the patient has only Medicare, then he or she is immediately discharged from Oriol's care when they do not return in the same day. Oriol does hold the bed for a reasonable amount of time without payment so the if the patient does not return, he or she will not be without a bed.

Oriol has many monthly costs to care for ventilator patients. Figure 3 compares some of the monthly expenses for patients in the Wachusett Unit. Advanced staffing is the cost for the pulmonologist consultant group to come into the facility, combined with the cost of the medical director. Both of these employees also bill the patients' insurance directly for visits so they are given base pay to be there. Nurse practitioners visit Oriol 4-5 times a week with no cost to the facility, as the Nurse Practitioners bill the patient's insurance directly. The emergency transport cost was calculated from the patient data. It

includes all transports from 2014 less the trips that were covered by insurance and scales it down to a monthly rate.

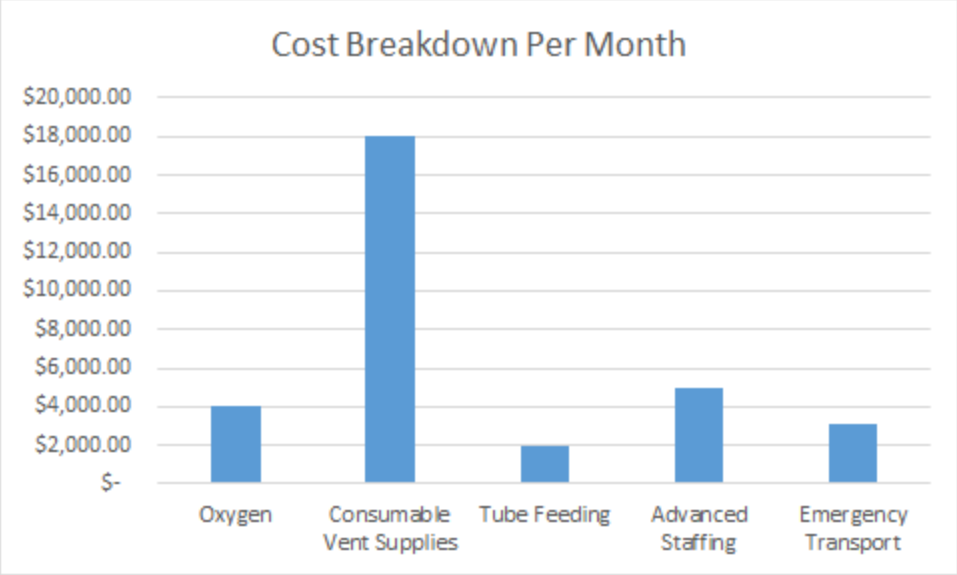


Figure 3: Current Monthly Costs

Figure 4 shows the costs that Oriol incurs while taking care of ventilator patients as well as transferring them to the hospital. The gray boxes represent the health care facilities and where the costs to Oriol arise. The red shapes emanating from the gray squares are costs to Oriol. The green shapes represent Oriol's income and they are connected to the insurance (in blue) that pays for it. This gives a visual explanation of how bed holds work. Once a patient is housed in the hospital, Oriol does not receive their normal income of $700 per day. Instead, insurance pays $80 per day to hold the bed. Oriol incurs a plethora of costs and they can be a bit difficult to keep track of. This chart spells out who pays for which costs and where these costs come from.

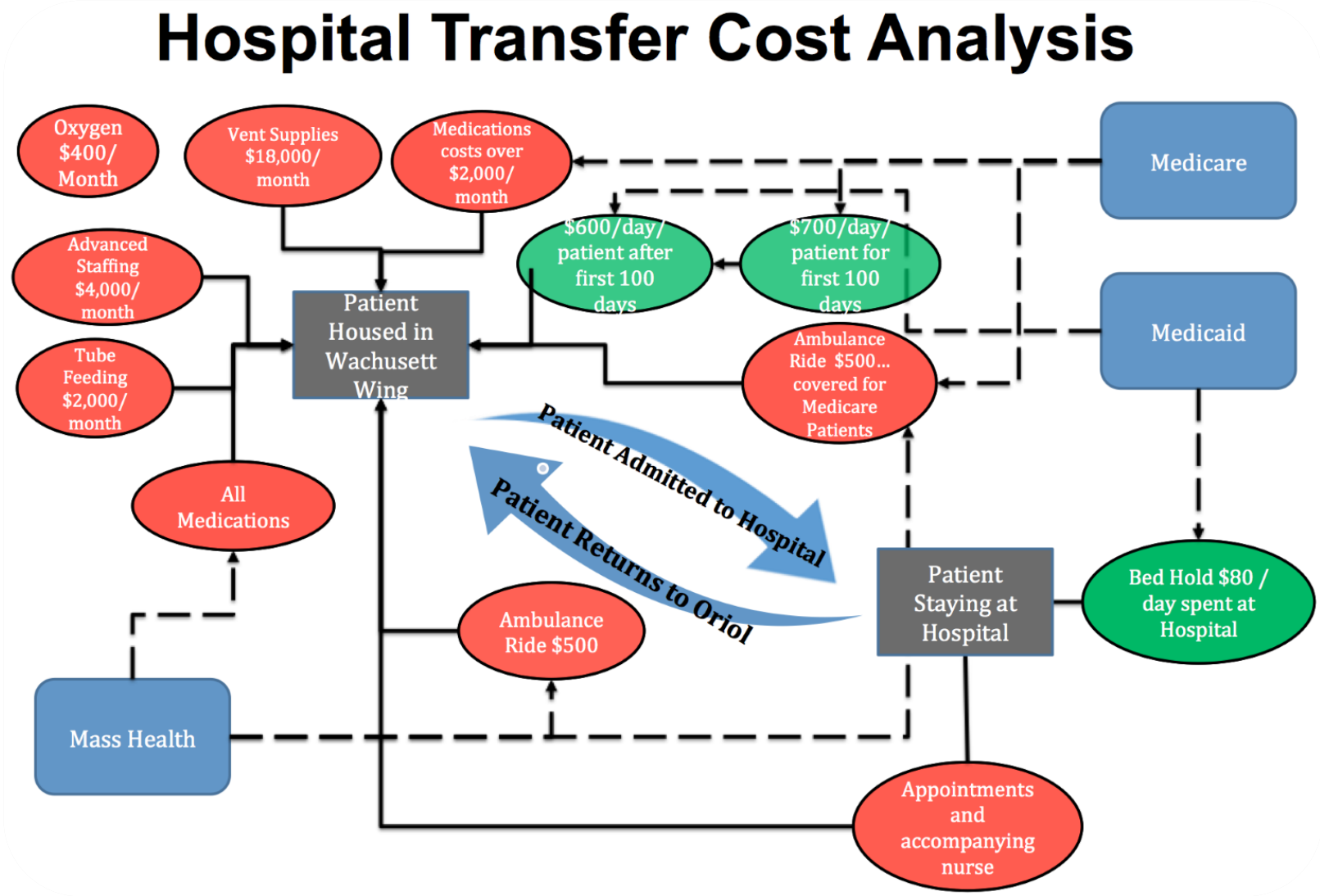


Figure 4: Current Cost Flowchart

4.1.5 Current Inter-facility Communication Structures

There is a succinct difference between the care that a hospital can provide and the care a skilled nursing facility can provide, which is why patients are transferred out of the nursing facility during acute emergencies. Maintaining constant communication is important in following through the proper care plans set by each health provider. Because of this, examining the current state of inter-facility communication between Oriol and the admitting hospitals is imperative.

Currently, representatives from Oriol Health Care meet with representatives from St. Vincent's Hospital to discuss "big picture" problems in the transfer of the medically complex patients and the policies by which they operate. For specific patients, case managers from Oriol meet with fellow case managers from St. Vincent's hospital to discuss recurring problems or admissions. In addition, when a patient comes back into the facility from the hospital, the charge nurse from the discharging hospital and the Oriol case manager have a "warm-handover" in which the charge nurse gives all of the discharge information. To supplement this verbal exchange, the discharging nurse from the hospital will also send over a comprehensive report; a redacted version of this report for one patient can be seen in Appendix A. These reports are sent back with every patient from Oriol Health Care.

The shift nurses at Oriol also send an Interact Form with each patient during transfers (see Appendix B) which describes a wealth of information about the patient's condition, including demographic information, medical diagnosis, and information pertaining to the acute episodic emergency which is sending them to the hospital. This appears to be the hospital's source of information for the patient.

4.2 Problem Analysis

This section is dedicated to defining and analyzing root causes of the proposed problem. In Oriol's case, the performance measure the team aimed to improve is the hospital admission and readmission rate. The procedures, technology and people were investigated to target the causes of the perceived increase in admissions. Below, in Figure 5, is a fishbone diagram (also called a cause and effect diagram) displaying the stems for each potential root cause. Each stem has its own investigation to come to a conclusion about the root cause of the problem.

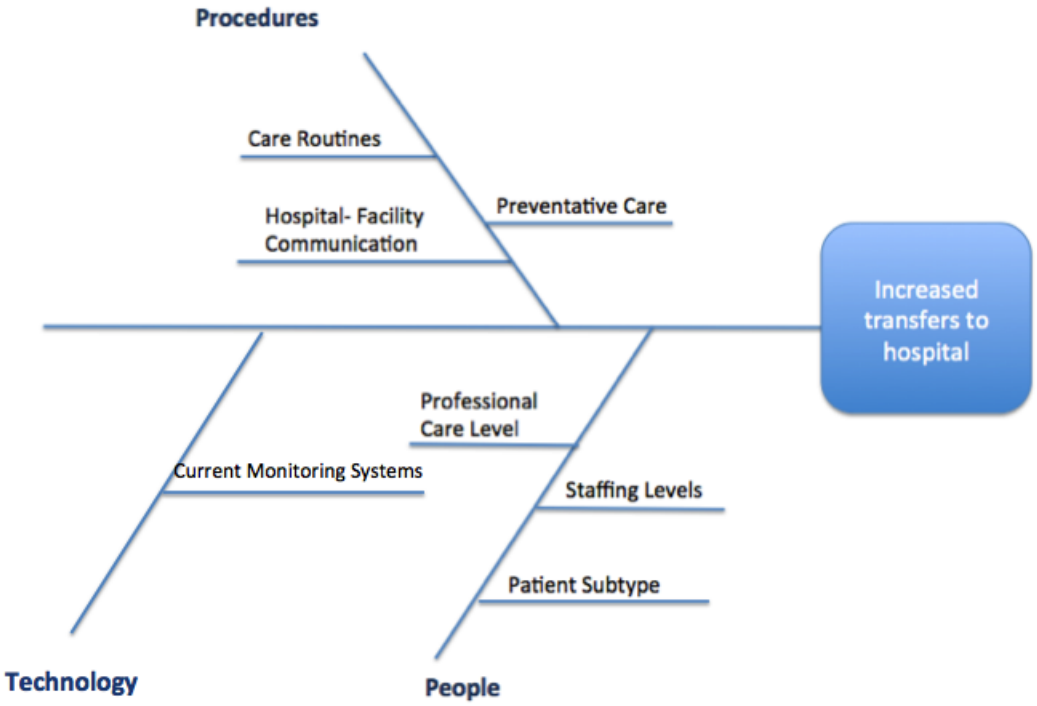


Figure 5: Cause & Effect Diagram

4.2.1 Policies and Procedures

Oriol's Board of Medical Directors has approved all policies for the standards and procedures of patient care. All policies and procedures for medical care and infection control either meet industry standards or surpass them. Therefore, the team decided it was outside the scope of the project to read and verify all of the Standard Operating Guidelines (SOG's) for patient care at the facility, since timely, extensive research into

industry standards would have to be done to evaluate and compare Oriol's SOG's to try to make recommendations. This effort would be a misplaced, as all of the guidelines have been verified by educated medical professionals who have determined that Oriol is surpassing expectations and no reasonable improvements could be made. As untrained students, the team does not have formal education and understanding of medical procedures, and would not be able to reasonably make recommendations in the patient care policies and procedures. Instead, the team decided to focus on other elements of the care process which may have a greater effect on reducing patient admissions.

4.2.2 Hospital Facility Communication

After analyzing Oriol's current state, the team identified one area of improvement to be the paperwork tracking patient conditions and communication with the receiving facilities. There were several instances in which the limited information recorded in patient charts impeded the group's ability to analyze some of the potential trends in admissions fully. For example, many patients had only pharmaceutical dosages entered, but did not always have the follow up treatment plans set forth by the hospitals in the documentation. In some cases, information regarding the care received in the hospital was sparsely communicated in the chart, so the actual diagnosis of the patient and ongoing treatment was unknown. In other records, the time of the patient's departure was not included, which impeded the group's ability to accurately track shifts with the highest admission rate. Sometimes, information regarding the patient's condition and interventions given before departure from Oriol was hard to locate in the notes. It is clear that information is being exchanged through the staff at Oriol and the receiving hospital, however, this information is not easily found in the software that Oriol uses.

There also appeared to be limited communication between Oriol and other hospitals about the long-term needs of the patients in the Wachusett Unit, and the responsibilities and interventions being provided by Oriol. If the receiving hospital has a better understanding of the long-term problems being seen in the Oriol patients, treatment may be more succinct, reducing time in the hospital. Improvements within these two

aforementioned areas can aid in the care of patients at both facilities, potentially resulting in lower readmissions into the hospital.

4.2.3 People

People may play a role in the admission/readmission of patients to hospital, whether it is the employees or patient subtypes. Our group explored the professional care and staffing levels, and patient subtypes for possible root causes or areas of improvement.

Professional Care and Staffing Levels

The group wanted to examine whether there were any patterns in patient admissions that indicated higher hospitals trips during any shift. This might indicate that there is not enough staff present to monitor patients regularly to detect deviation from the baseline condition quickly enough to prevent a hospital admission. The team was unable to determine whether increased admissions occurred in any particular shift because the documentation in PointClickCare was not accurate for all admissions. For example, an entry tracking the admission of a patient may have been completed on the next shift, or in some cases, a specific time was not included. In addition to this, the current documentation being sent to the receiving hospital with each patient transfer is out of date and does not always completely encompass the unique and dynamic medical condition of each patient. Recommendations to improve communication about patient admissions are made in Section 8.2. The team focused on communication to supplement the documentation level, which can yield better documentation to support future analyses. Improvements and updates to current forms used by Oriol can be found in the appendices, and recommendations can be found in Section 8.2.

Patient Subtype

Looking at the number of hospital admissions grouped by patient subtype showed that there are some subpopulations that have slightly more admissions per number of patients. The data suggests that patients who have had a stroke, also known as a CVA,

have slightly higher admissions to the ER than other group. The larger group of patients who have been grouped in the miscellaneous category would innately have more admissions because they are not a homogeneous population. By using the data grouped by subpopulation, Oriol can target specific patient populations who tend to be more vulnerable and may need closer monitoring during a shift.

4.2.4 Technology

Our team researched new advances in technology that would help Oriol's patient in the Wachusett Unit. Through research, our team learned about the implementation of a digital ICU in many hospitals. This concept would help the patients at Oriol, since monitoring of the vitals can spot a change in their condition at any moment. Through meetings with Oriol's CEO, our team learned that Oriol currently did not have a monitoring system for their patients. The digital eICU comes with a very large price tag, therefore our team wanted to research an affordable option. Our team broke down elements of the eICU concept to create our own variation.

To accomplish this we investigated the types of technology that the digital eICU is using and tried to determine what Oriol's patients could best benefit from. Investigating the types of monitors that the eICU was using was our first step. The monitors can vary depending on the patient's needs, therefore the types of monitoring systems that Oriol would need could be all the same. The monitors of interest would be those that could keep track of the patients breathing. Since there were previously no monitoring systems, the patients could benefit from any system that would alert a nurse about a change in condition. By contacting different providers of these monitors, we were able to learn the types of monitors that would work well for patients in the Wachusett Unit. Our team also wanted to consider the patient's lifestyle within the facility and try to incorporate monitors that can keep the patients mobile. The team created a list of important measurements that would aid in the care of the patients so when looking for possible monitors we knew what features would be considered for our decision. We created a table of the basic measurements taken to monitor patients (Table 7) and then advanced measurements that would focus on the respiratory system (Table 8).

Table 7: Basic Monitor Features

CO2	Will measure the oxygen in the blood, would give nurses idea of how well the patients oxygen is flowing.
SP02	Will measure the oxygen in the blood, would give nurses idea of how well the patients oxygen is flowing.
ECG/EKG	Measures heart rhythms, allows nurses to notice changes in condition.
Blood Pressure	If not around baseline nurse can note issues with patient.

(Singer, 2009)

Table 8: Advanced Monitor Features

Tidal Volume	Tidal Volume is the amount of air inhaled and exhaled, help nurses notice change in condition if this changes.
Minute Volume	Measures the volume of gas inhaled and exhaled per minute.
Positive End expiratory pressure (PEEP)	Improves oxygenation, and increases ventilation.
Peak inspiratory (PIP)	Measuring the PIP will help identify if there is an air leak in the ventilator.
Dynamic Compliance	Compliance will measure the change in volume in the respiratory system, should maintain a certain level for proper ventilation.
Airway Resistance	The increase of airway resistance can suggest kinking or a block in the endotracheal tube.

(Singer, 2009)

Our next step was to show how we could integrate the technology and the processes that would change with the new design. The integration of the new technology would change the care process for the nurses as well as the methods of communication. Our team designed process maps and carefully planned how the new technology would change their routines. Our team met at the facility to document the layout of patient rooms. The team used Microsoft Visio to create blueprints of the rooms.

4.3 Summary

As the team brainstormed ways to decrease the admission rates from the Wachusett Unit, one potential opportunity was preventative care at Oriol. The team theorized that if more measures could be taken by the staff in Oriol to prevent emergency transfers, the facility (and patients) would be less susceptible to them. In addition, the group believed that a more advanced monitoring system needed to be in place for the patients in the Wachusett Unit, and strived to find a solution which allowed for patient's decreasing health to be noticed sooner, which may allow for more in-house interventions faster. This, among evaluation the facility's care practices, could reduce admissions into the Emergency Department.

Another problem that could be contributing to the increased rate of admission is the communication between the hospital and Oriol. During data extraction, the team noticed that frequently, some progress or hospital notes were not included in a patient's record. A solution was needed for this inconsistency.

5.0 Future State

To develop the future state, the team recommended solutions to optimize the care process and operations in the facility. Implementing these suggestions will create a more complete treatment and monitoring environment that will potentially reduce the frequency of admissions to the hospital from the Wachusett Unit.

5.1 Adapted Electronic Intensive Care Unit (eICU)

To more quickly identify changes in patients' conditions, the team recommends installing up to date monitors such as those used with eICU systems and connecting them to the patients in the Wachusett Unit. We would like the monitors to alert the on-call professionals when there is a change in the patient's vitals. We recommend that two-way calls and video chat capabilities be installed so the patient can talk to his or her doctors as well. The new design would allow the nurses to monitor all patients and react more quickly to changes in conditions. The monitors provide data that together with the nurse may provide the patient with even better quality care.

Monitors

The digital eICU alternative the team created would start with the monitoring systems that would be connected to each patient. The team compared several monitors keeping cost, functionality, and mobility in mind. One monitor in particular seemed to be a good fit for Oriol's patients. The monitor was created by Philips Corporation and is called the SureSign VM1 monitoring system, as seen in Figure 6.

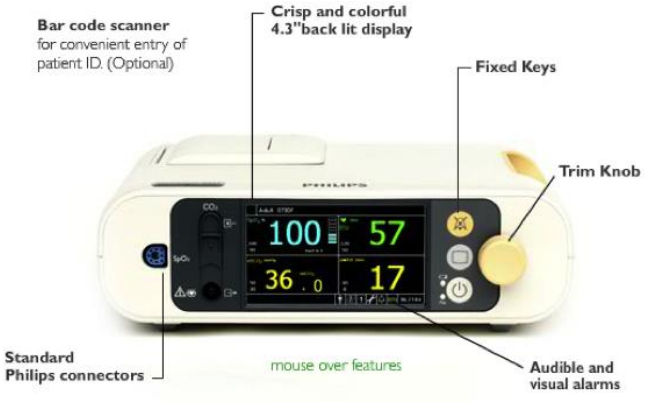


Figure 6: SureSign VM1 Monitor (Source: Phillips)

These monitors would be connected to the patients to give a consistent read of the patient's SpO2 and CO2 measurements and trending data. This monitor is small and has the capability to be portable. This type of monitoring system would works well for the Oriol patients who are able to maintain an active lifestyle within the facility. For the monitoring system to become portable, it would have to be placed on a cart for the patients to move with them. The monitors have audible and visual alarms. These types of monitors will allow the nurses to continue their work and to be notified if any change in the patient's condition occurs. The monitor's information can be automatically downloaded into the patients' records, the system offers privacy with the bar code scanner, where the nurse would scan a patient's ID bracelet to ensure they are a match.

Oriol's new care process would not undergo a drastic change; the main change would be the way nurses are noting health issues in the patients. In the beginning of the process, the nurse can notice health issues from the same regular rounds they make or from the monitoring system. The monitors may catch the change in the condition more quickly allowing the nurse and on call physician more time to treat the patient in the facility. When the nurses do rounds on their shifts, they currently take all the vitals. With this monitor, they can automatically download the data from the monitor. The nurse can then enter other notes into the patient's records or any additional measurements. The monitoring data can all be downloaded on the current computers that nurses use to take their current notes, so there will not be a need for further investment. Once the monitors notice a change in the patient's condition the nurse can treat the patient or contact the on-call physician, through telephone or through further investments in two-way video systems. The video call technology is present within many digital eICU's and allows the doctor to have a more personal experience with the patient. The two way video calls would be made with the nurses' computers from their stations. The nurse's stations are mobile so they can be brought close to the patient's bedside. The computers are already accessible to the nurses so the two-way call option would not require any further costs for hardware. The physicians would be able to use personal computer devices since the software is kept secure. Companies like SecureVideo offer networking plans for the communication between doctors and patients. The software is used to allow the doctor to

access the patient's data. SecureVideo offers multiple plans that allow video conferencing and other features. The program is HIPPA compliant, so nurses can trust the security of the software. Once the nurse has contacted the physician, the physician can make appropriate recommendations for the patient. With the monitoring system, a change in condition may be caught more quickly, leaving time for in house treatment options. The new process map is shown in Figure 7. Figure 8 shows the steps for dealing with medical problems.

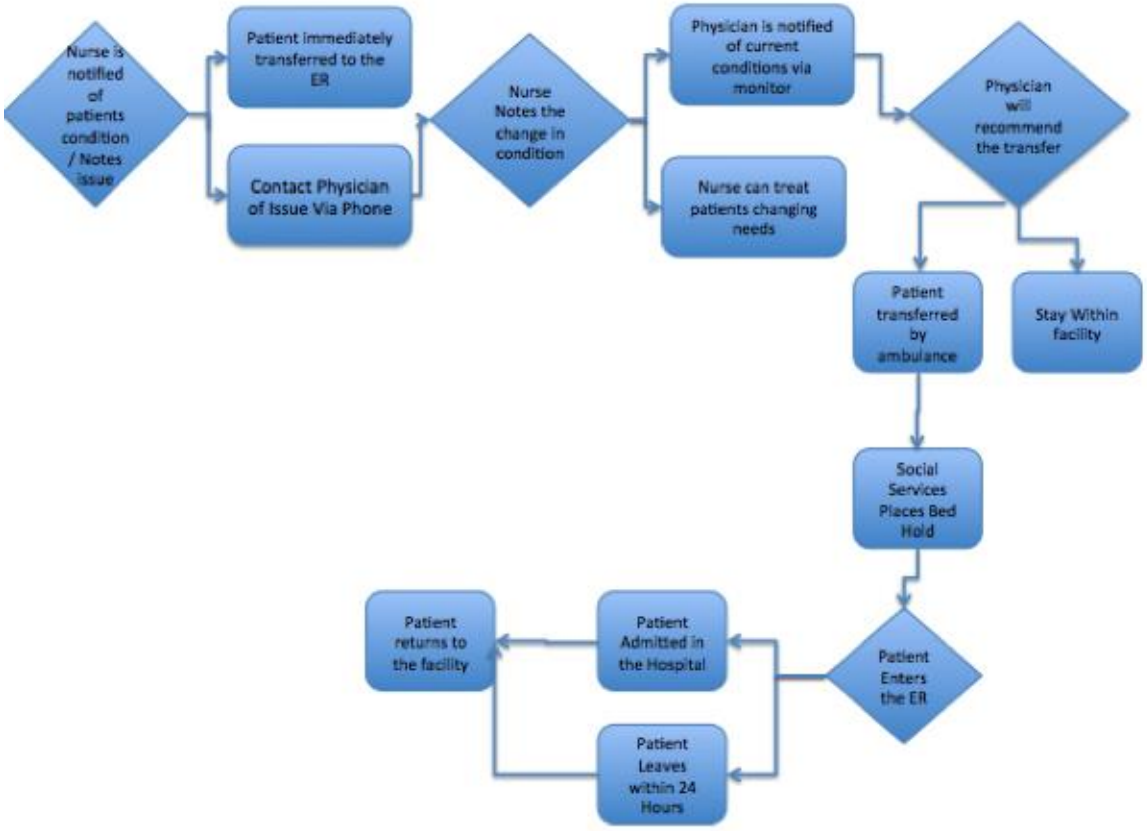


Figure 7: Proposed Care Process Map

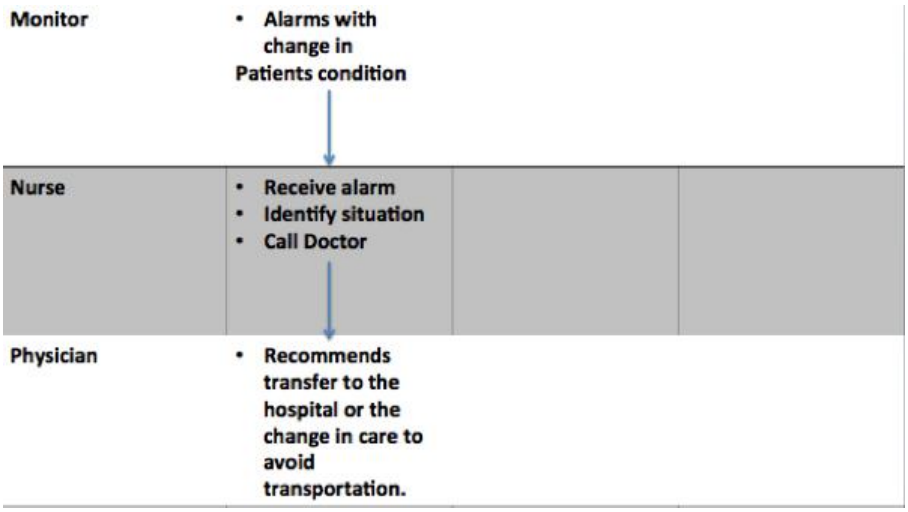


Figure 8: Recommended Care Process

The team wanted to ensure that the suggested monitoring equipment would fit into the patient's rooms, therefore created a depiction of their bedroom to show where the monitors can go. Figure 9 shows the average bedroom of a ventilator patient, the suggested monitors are small enough to fit on the bedside table to the left of the patient's bed. The monitor would sit below all the necessary ventilator equipment.
Implementing such a process should start with the introduction to the staff. The feedback from nurses and physicians can help understand how their roles will be affected. The feedback can also offer better suggestions for the process, since the nurses and physicians best understand the process.

Nurses may be resistant to change and feel as though it will be taking away from their jobs, but the nurses should be made aware that staffing levels will not change and this monitoring will serve as an extra pair of eyes and ears.

Figure 9: Current Room Layout

Expense

The Sure Sign VM1 monitor is one of the more affordable options for patient monitoring. The monitor will cost Oriol an upfront fee for the technology, but since the monitors are connected to employees already employed by Oriol, they will not need to pay for any additional employees to monitor the patients. The Sure Sign Vm1 monitor has an estimated cost of $6,000 per unit. Other costs would include that of the assistance cart if needed or preferred by patient. Other costs of the system would include the costs

of the software used. The software associated with the company our team looked into did not include the use of contracts and billed monthly. The software also varied with different plans, offering many affordable options.

The training for the new processes would be another potential cost; this could be relatively low depending on how training was completed. Training for the use of monitors can be a service provided by the Philips Corporation or Oriol may decide to train their employees using an experienced nurse, which may be a less expensive option. The software provider can provide the training on the calling system.

The benefits from the system are designed to outweigh the costs. The monitoring of patients via eICU technologies has been recognized for reducing readmissions into the hospital and saving lives. This will help save money on transportation costs, the potential cost of losing a patient from Oriol's care, as well as hopefully saving lives. It is hard to estimate the exact number of patient's lives the machine could save since nurses now consistently check on the patients. To accurately estimate if the systems improves cost, data on the amount of times the change in condition was recognized by a nurse or monitor should be tracked, then the potential costs of an ambulance transfer can be computed if in fact such transfers were avoided.

Alternative Design Options:

Together our team researched many monitoring systems and considered several options for Oriol's facility. One design option we condisered included the use of a more expensive monitoring option. The IntelliVue MX40 wearable patient monitor was a good monitor of choice for the patients of Oriol. This type of monitor is a wearable portable monitoring system that would allow the patients of Oriol to be active within the facility and still enjoy their daily activities. This monitoring system would keep track of the patients ECG, SpO2, and blood pressure. This monitor would be easier for the patients to wear around the facility since they are small enough to wear around their necks. The device takes non-invasive blood pressure and pulse oximetry, so the patients are free from additional cables. The process for this design would work the same as the other

monitoring system we suggested. These monitors would be more expensive and a system wide installation would cost an estimated $200,000, which would be a one-time fee.

5.2 Improving the Interfacility Communication Structure

The ideal communication structure, both within the facility and externally to other facilities, would be one where doctors can correctly identify the patients' care needs from the information Oriol provides. Information provided to the hospital should be clear, succinct, and meaningful. Improving the documentation that Oriol provides during the hospital transfers for each patient would support this communication.

In order to increase the accuracy and reliability of the patient information, steps need to be taken to ensure that the flow and depth of communication remains consistent even during emergencies out of Oriol's Wachusett Unit. When a patient's medical condition deviates from baseline negatively and quickly, the staff at Oriol may not have much time to gather all of the information necessary to explain the complicated medical diagnoses of the patient to the hospital. Therefore, to improve the communication between facilities about the patient's condition (both long-term problems and acute episodes) the team suggests that the facility create an in-house form with only the information they need to share about their patients. The current Interact forms being used have information that is not necessarily relevant to the patients in Oriol, nor does it include some information pertinent to the nature of the Wachusett Unit. In addition, the team suggests pre-populating these forms in each patient room, so less time is spent in emergencies trying to fill out these forms.

A sample of new forms that could be used are found in Appendix C. These samples are from Interact, a quality improvement program started by the Centers for Medicare and Medicaid Services, which attempts to reduce acute care transfers out of nursing homes. The updated forms found in the Appendix are the 2014 version of the original forms implemented within the program. The new forms are more clear and easier to understand while minimizing the time spent reading it. Version 4.0 Tools have been improved based on ongoing user feedback, and to facilitate incorporation into electronic

health records and other forms of health information technology. The forms have been substantially revised to make it a more comprehensive and user-friendly evaluation. The criteria for notifying the clinician have been made more consistent between the different forms. In addition, a “stop and watch” early warning tool has been added to facilitate its use in routine monitoring of high-risk residents by adding a checkbox for "no change".

The team would also like to see more Quality Assurance (QA) in the Wachusett Unit in regards to their documentation. The best way to go about this would perhaps be to place one lead medical professional, such as the Director of Nursing, or the nurse in charge of training, in charge of QA; this entails reviewing the medical charts for patients who have been transferred out of the hospital each day, and confirming that all information in the "warm hand-over" from nurse to nurse is also documented, or better yet, directly scanned into the PointClickCare system. This would ensure that charts are completed, edited, and signed in no more than 24 hours. A more extensive QA process would results in an increase in the detail and completeness of documentation. This will allow the facility to more accurately track their admissions in the future to identify any problems in follow up care. The team also thinks that an updated or more intensive training procedure on documentation would be beneficial to employees, and perhaps would help prevent the limited documentation the team observed related to hospital transfers. In addition, more of a focus on documentation from directives issued by the leaders of the facility, or an extra half hour allotted at the end of each shift solely for documentation purposes would improve the wealth of information in the medical records.

Finally, it is recommended that representatives from Oriol Health Care meet with representatives from the UMass Hospital System in addition to continuing to meet with representatives from St. Vincent. Although the nurses from each facility exchange information during discharge, representatives that coordinate larger programs and goals for each facility should discuss how they can both improve care. Oriol should articulate the needs of the patients in Wachusett Unit, so the hospital understands the unique population served and risk factors associated with these patients.

5.3 Policy Change

To further decrease the number of patient admissions into the hospital, after pursuing the recommendations in Section 5.1 and 5.2, Oriol can explore giving more medical interventions to patients at the Oriol facility, which are comparable to those given in a hospital. Although Oriol is a skilled nursing facility and therefore limited in its ability to intervene during acute episodes of medical distress, Oriol could push for policy and procedural change that allow some treatments to be within their scope of practice.

Oriol's Skilled Nursing facility is considered the patients home, and provides all patients around the clock care related to their respiratory deficiencies. Traditional skilled facilities are not meant to provide patients further medical interventions or provide in house testing, but Oriol is a unique bridge between home, nursing facility, and treatment center. The term skilled nursing facility has been traditionally seen as a long-term home, even if the professionals within the facility are qualified to provide more care. In this case, the professionals affiliated with Oriol should push to use their breadth of knowledge to provide scans or x-rays, EKG's, and a wider range of testing abilities, which are currently limited to the hospital, in order to have some of the comparable diagnostic abilities.

However, different insurance plans may or may not cover the types of interventions that Oriol would want to provide to reduce admissions. To expand its treatment to patients, Oriol would need to lobby for a significant policy change to both the restrictions on their scope of practice and the insurance coverage of treatments within the facility.

6.0 Conclusions and Recommendations

The goal of the MQP was to research hospital admissions from Oriol's Wachusett Unit and recommend ways to track and reduce them. The WPI MQP team worked alongside Oriol's Skilled Nursing facility to evaluate the rate of admissions and readmissions. This began with extracting the medical data for demographic information and medical diagnoses. This data was viewed in various ways, including by subpopulation according to diagnoses and by year and quarter to determine if there was an increase over time. The analysis determined that there was a 30% increase of admissions per year from 2013 to 2014. In addition, patients who had a CVA, or a stroke, were admitted to the hospital at a slightly higher rate than other groups. While examining this data, the team found that more thorough documentation of any hospital admissions in the Point Click Care Electronic Medical Record system would be valuable. Although a great amount of information is relayed from the nurse of the discharging hospital to the nurse in Oriol Health Care in charge of the patient, not all of this information was getting recorded. Documentation improvements, and developing more of a relationship with the other hospitals to foster communication and discuss long-term goals, were determined to be two areas of improvement. Improvement of the documentation could aid in further improvements later down the road, as more data will be available to researchers. Improving communication will help with the care of the patients and keep nurses and doctors on the same page with care routines, this can potentially keep patients out of the hospital and shorter stays in the hospital.

From here, the team investigated preventative care strategies at Oriol. The standard operating procedures were assumed satisfactory given that a board of qualified medical directors approved them. However, while investigating the care process, the team noted that patient status was not monitored electronically. Patient vitals were taken once a shift by a CNA or a Nurse, but patients did not consistently have an electronic monitoring system, which tracked vital signs and other important information over time, and alerted the staff when there was a deviation. The team determined this to be an area of improvement with significant potential to reduce hospital admissions. If an electronic monitoring solution was implemented, Oriol could expect to see a reduction in the

amount of hospital days their patients experience. This would result from earlier recognition of problems and better knowledge of conditions and treatment in an emergency situation.

Using the data and information about Oriol's current state of operations, the team analyzed potential causes of readmission; for example, some subpopulations of the patient body are suffering from the lasting effects of CVA's were found to be admitted to the hospital slightly more often. In addition, Oriol does not monitor patients' vital signs electronically, so a patient's health can deteriorate until the next checkup by the nurse. Documentation and interfacility communication also needed significant improvement. Our recommendations include adding electronic monitoring to the Wachusett Unit, with potential external monitoring, and improving communication with hospitals. Improvements in these areas will help address health issues before a hospital visit is required in some cases and save resources.

6.1 Recommendations

The proposed monitoring system and additional documentation proposed by the team create a plan for a future state; the team has several recommendations for next steps that Oriol, or a future project group, could take to implement these suggestions and to examine the effect on hospital admissions. We suggest that a target goal be created and measured over time. For this to be effective, one cause should be isolated, a potential solution implemented, and studied over a given amount of time. For example, a group may study if intervening earlier in acute episodes by using monitoring machines reduces transfers out of Oriol and the potential impact on patient care and costs. In order for this to be accurately measured, more concrete cost data is needed to evaluate savings to Oriol by reducing admission by the target goal.

Our project can be further expanded in terms of policy changes as well. The team focused on the policies that surrounded the medical interventions of ventilator patients within the facility. Another group can further research as to why such policies exist and how they can be changed. Further research in this area can expand the care given at

skilled nursing facilities and reduce the transition of patients from different locations. The reduction in transfers can lead to better care for the patients, since they will remain under consistent care, as well as lift cost burdens for the patient's insurance. When another team looks further into these policies they will need to understand the Medicare and MassHealth programs, as well as the care restrictions of skilled nursing facilities. Our proposed changes would help monitor the patient's health and catch any changes in their condition, although if our monitoring system catches a condition and the patient still needs the care provided by the hospital then Oriol will still need to transfer the patient. If Oriol is able to expand the medical interventions they provide, then the patient can be given the care in one place. For more capabilities, policies will need to change and Oriol may need to buy more equipment to aid in the care.

6.2 Engineering Design Reflection for IE

The engineering design process requires a team to identify and define a problem, then through research and analysis, design implementable solutions. After the solutions are formed, they are evaluated to see if they are solving the original objective, or an iteration of that objective. A good process should also evaluate the appropriateness and effectiveness of the solutions (Reymen, 2002). This project started with a general problem of increased patient admissions to the hospital. By using the A3 process, the team collected and analyzed data, then used the findings from the data along with research to create alternatives for the facility, which may reduce admissions. The team wanted to consider cost, functionality, and feasibility when creating recommendations so Oriol could create different types of recommendations that could be implemented easily.

This project created an improved communication system to work within Oriol to provide the best care and to increase what is known about those patients. This alternative does not necessarily solve the original problem of decreasing admissions but it will raise the awareness of nurses about what has happened to their patients in the hospital. By implementing quality assurance measures, the facility can prioritize what information is sent along with a patient to the hospital as well as what information is documented on the

patient's return. This would aid in the care given at Oriol and possibly that given at the hospital as well.

The other alternative set forth by this paper is to implement a modified eICU. This solution directly addresses the original project objective. Improving the monitoring of patients' conditions could prevent some admissions or identify new problems earlier. If policy could be altered, this system would be satisfactory as well as efficient. One drawback to the solution would be the cost to install and operate the unit. If Oriol could make use of another call center, the option would be much more appropriate and affordable.

6.3 Lifelong Learning

The project gave the team an opportunity to work on a real problem in industry. To accomplish this project, our team used the necessary communication skills, problem solving skills, teamwork, basic business understanding, and the application of our curriculum to create solutions for Oriol.

Our team has a group of three industrial engineers who applied their knowledge of lean systems and process improvement to healthcare. When working on the project the team assessed the demands of the task, evaluated our own knowledge and then created a plan. The application of lean systems is not addressed within the curriculum, therefore the project also became a learning experience. The team applied and enhanced their knowledge of A3 problem solving technique to go through the process.

All team members learned how health care policy plays an active role in process improvement, along with learning about processes and new technologies. The healthcare system is always changing and is now being transformed with the advances in technology; this demanded that our team learn the specifics of health care policies, procedures, and technologies.

Within the classroom, problem-solving skills are taught, but seldom can be applied in industry before graduation. In this project, our team learned how to understand the complicated process of a business to gain information about its intricacies and to

recommend solutions. The team also learned how to work with professionals from different disciplines, which were not familiar to us. In addition, the team learned how to adjust to others' working styles as a group to unite over a common goal and to execute a plan for effective results.

7.0 References

"About Cerebral Palsy." Cerebral Palsy Alliance. N.p., n.d. Web. 14 Mar. 2015.

Dartmouth Atlas Project. "The Revolving Door: A Report on U.S. Hospital Readmissions." *Robert Wood Johnson Foundation*. Robert Wood Johnson Foundation, 1 Feb. 2013. Web. 4 Oct. 2014. <http://www.rwjf.org/en/research-publications/find-rwjf-research/2013/02/the-revolving-door--a-report-on-u-s--hospital-readmissions.html>.

Eagleson, Theresa. "Nursing Facility Ventilator Rates." *Illinois Department of HFS*. Bureau of Long Term Care, 18 Feb. 2014. Web. 4 Oct. 2014. <http://www.hfs.illinois.gov/html/021814n1.html>.

"Encephalopathy: Learn About Causes, Types and Symptoms." EMedicineHealth. EMedicineHealth, n.d. Web. 16 Mar. 2015.

Hagland, M. (2011, June 23). Innovation In The EICU. Retrieved January 17, 2015, from http://www.healthcare-informatics.com/article/innovation-eicu

"How to Pay for Nursing Home Care." Paying for Nursing Home Care: Financial Assistance and Insurance Benefits. N.p., n.d. Web. 11 Oct. 2014. <http://www.payingforseniorcare.com/longtermcare/paying-for-nursing-homes.html#cost-table>.

Kaynar, Ata Murat. "Respiratory Failure ." *Medscape*. 1 Aug. 2014. Web. 4 Oct. 2014. <http://emedicine.medscape.com/article/167981-overview>.

Landro, L. (2009, October 27). The Picture of Health. Retrieved January 15, 2015, from http://www.wsj.com/articles/SB10001424052970204488304574428960127233136

Martin, Richard. "Florida Hospitals Stuck with Long-term, Costly Ventilator Care." *Tampa Bay Times* 14 Aug. 2011. Web. 3 Oct. 2014. <http://www.tampabay.com/news/health/florida-hospitals-stuck-with-long-term-costly-ventilator-care/1186020>.

"Medicare." *Social security bulletin* 2004: A35-50. *ProQuest.* Web. 15 Oct. 2014

Melanson, Patrick. "Acute Respiratory Failure." *Critical Care Medicine*. McGill University. Web. 4 Oct. 2014.

Naylor, M. (2009, October 27). Transitional Care: Moving patients from one care setting to another. Retrieved January 17, 2015, from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2768550/

"Nursing Facility Reimbursement Methodology Report." Mississippi Division of MassHealth, 1 Jan. 2014. Web. 4 Oct. 2014. <http://www.MassHealth.ms.gov/wp-content/uploads/2014/03/0114_NursingFacilityReimburseMethod.pdf>.

Rau, Jordan. "Medicare Fines 2,610 Hospitals In Third Round Of Readmission Penalties." *Kaiser Health News*. 2 Oct. 2014. Web. 4 Oct. 2014.

"Readmissions Reduction Program." *Centers for Medicare & MassHealth Services*. Centers for Medicare & MassHealth Services, 4 Aug. 2014. Web. 4 Oct. 2014.

Rouse, M. (2012, July 1). What is electronic intensive care unit? Retrieved January 18, 2015, from http://searchhealthit.techtarget.com/definition/Electronic-Intensive-Care-Unit-eICU

Simon, K. (2010, February 26). The Cause and Effect (a.k.a. Fishbone) Diagram. Retrieved October 15, 2014, from http://www.isixsigma.com/tools-templates/cause-effect/cause-and-effect-aka-fishbone-diagram/

Singer, B. Corbridge, T. (2009). "Basic Invasive Mechanical Ventilation." *South Med Journal*. 102(12). P. 1238-45. Retrieved March 4, 2015.

"Skilled Nursing Facility (SNF) Care." *Your Medicare Coverage*. USA Department of Health and Human Services, 1 Jan. 2014. Web. 3 Oct. 2014. <Your Medicare Coverage>.

Steps of the A3 Process. (n.d.). Retrieved October 13, 2014, from http://www.coe.montana.edu/ie/faculty/sobek/a3/steps.htm

Understanding Stroke." National Stroke Association, n.d. Web. 16 Mar. 2015.

"Ventilator Types." *Living with a Vent*. Covidien. Web. 4 Oct. 2014. <http://www.livingwithavent.com/pages.aspx?page=Basics/Types>.

"What Are Long Term Care Hospitals?" Medicare. USA Department of Health and Human Services, 1 Aug. 2014. Web. 2 Oct. 2014. <http://www.medicare.gov/pubs/pdf/11347.pdf>.

"What Causes MS?" National Multiple Sclerosis Society. N.p., n.d. Web. 03 Mar. 2015.

"Whittier Rehabilitation Hospital." *Whittier Health Network*. Web. 4 Oct. 2014. <http://www.whittierhealth.com/rehabilitation_hospitals/westborough.html>.

Reymen, I.M., Hammer D.K. (May 14 - 17, 2002) "*STRUCTURED REFLECTION FOR IMPROVING DESIGN PROCESSES*"https://www.designsociety.org/download-publication/29668/structured_reflection_for_improving_design_processes

Appendix A: Warm Hand-Off Note

Umass Memorial Medical Center

Patient: [redacted]
Acct.#: [redacted]
MR#: [redacted]
Date of Birth: [redacted]
Admit: 01/26/2015
Discharge:
Loc: UU 4 West
[redacted]
Dict Date: 01/28/2015
Trans: 01/28/2015 11:40 AM

STAT Discharge Summary

DATE OF ADMISSION: 01/26/2015

DATE OF ANTICIPATED DISCHARGE: 01/28/2015 versus 01/29/2015

PRIMARY DIAGNOSIS: Right proximal humerus fracture.

PRIMARY PROCEDURE: Right proximal humerus open reduction and internal fixation on 01/27/2015.

PRIMARY ATTENDING: [redacted]

HISTORY OF PRESENT ILLNESS: The patient is an 89-year-old gentleman who sustained a mechanical fall onto the right shoulder, sustained a right displaced 2-part proximal humerus fracture. The patient was seen and evaluated by [redacted] and after a lengthy discussion, the patient agreed to undergo open reduction and internal fixation. Risk and benefits of surgery were discussed with him prior to his procedure.

PAST MEDICAL HISTORY: Myelodysplasia, type 2 diabetes, hypertension, hyperlipidemia, CAD, AFib off of Coumadin.

PAST SURGICAL HISTORY: Cholecystectomy.

CURRENT MEDICATIONS: Aspirin, atenolol, atorvastatin, donepezil, Lasix, glipizide, metformin, vitamin B6, ramipril, vitamin B12.

ALLERGIES: No known drug allergies.

SOCIAL HISTORY: The patient denies smoking, alcohol and IV drugs.

FAMILY HISTORY: Noncontributory.

PHYSICAL EXAMINATION:
GENERAL: The patient is A and O x3.
HEENT: Head is atraumatic, normocephalic. Extraocular muscles intact.
NECK: Trachea is midline, no cervical lymphadenopathy.
HEART: Regular rate and rhythm.
ABDOMEN: Soft, nontender, nondistended.
EXTREMITIES: Well perfused. The patient has positive EPL, FPL, interosseous and grip. Sensation to light touch is intact in the right median, ulnar as well as radial nerve distribution. The patient has 2+ radial pulse.

BRIEF HOSPITAL COURSE: The patient is an 89-year-old gentleman sustained a mechanical fall after slipping on ice and sustained a right proximal humerus fracture. The patient was seen and evaluated by [redacted] and agreed to undergo open reduction and internal fixation. The patient was admitted on January 26, 2015. The patient underwent open reduction and internal fixation of the right proximal humerus on 01/27/2015. The patient tolerated the procedure well without any complication and was transferred to the PACU in stable condition. On postop day #1, the patient was seen and evaluated by orthopedic surgery team. Vital signs were stable, no acute distress. Examination of the pati

ent's right upper extremity reveals that the dressing was clean, dry and intact. The patient has positive EPL, FPL, interosseous and grip. Sensation to light touch is intact distally in the median, ulnar as well as radial nerve distribution with brisk cap refill. The patient was placed on high insulin sliding scale. The patient is anticipated to be discharged pending PT and OT evaluation.

DISCHARGE MEDICATIONS: Please refer to the patient's discharge paperwork for a comprehensive list of his discharge medications.

DISCHARGE INSTRUCTIONS: The patient should be nonweightbearing on right upper extremity in the sling and swath. The patient should follow up with [redacted]n approximately 7-10 days after discharge for inspection of his right upper extremity incision. The patient should return to the Emergency Department if he experiences fever, chills, nausea, vomiting, constipation, diarrhea, shortness breath, chest pain, increased redness, drainage, or pain coming from his right upper extremity, incision or any other signs or symptoms of concern.

Attending: [redacted]

[redacted]

cc:
[redacted]

== UMass Memorial Medical Center ==

HOSPITAL: University
HOSPITAL MEDICINE CONSULT NOTE
Date: [redacted]
Time: 23:19
Hospital Day #: 1
Patient Name: [redacted]
Admission Date: 01/26/2015
Location: [redacted]
Resident Name: [redacted]
Resident Pager: [redacted]
Attending MD Name: [redacted]
Date of Service: 01/27/2015
Account [redacted]
Medical Record [redacted]
DOB: [redacted]
Age: [redacted]
Sex: [redacted]
Chief Complaint: Right Humerus Fracture
History of Present Illness: [redacted] a very pleasant 89 year old male with a past medical history significant for coronary artery disease (reported s/p NSTEMI in 2000), non-insulin dependent diabetes, myelodysplastic syndrome, and atrial fibrillation and we are being consulted for evaluation of his pre-operative risk assessment after a right humerus fracture.

According to [redacted] he was walking down the hill from his house to take out his trash when he slipped on some black ice and landed on his right shoulder. The patient was down for some time before someone drove by and got out to help him get back in his house. The patient then called the police who brought him to the Emergency Department.

In the Emergency Department the patient had an x-ray of his right arm which demonstrated a "displaced, impacted humeral neck fracture." The patient was seen by the Orthopedic Surgery service who recommended that the patient have a surgical intervention, however, they have asked for hostpial medicine consult for preoperative risk assessment.

The patient reports to me that he does not rememberiing having a heart attack in the past. He reports to me that he is still very active at home. he says that he lives alone but does all of his housework on his own. He reports that he has a large piece of land (almost 22 acres) which he cares for. He reports that he never has chest pain when doing all of his home chores.
Treatment Received: None

PAST MEDICAL HISTORY
Other history: Myelodysplastic syndrome
HTN
HLD
CAD s/p NSTEMI
T2 diabetes (non insulin dependent)
Aortic sclerosis (without stenosis)
Prior history of pericardial effusions

PAST SURGICAL HISTORY
Cholecystectomy

MEDICATIONS

CURRENT MEDICATION ORDERS

Name	Dose	Route	Freq	Start Date	End Date
ACETAMINOPHEN (TYLENOL)	650 MG	ORAL	Q6HPRN	01/26/2015 22:36	02/25/2015 22:35

ATENOLOL (TENORMIN)	50 MG	ORAL	DAILY (0900)	01/26/ 2015 22: 46	02/25/ 2015 09: 00
DOCUSATE SODIUM (COLACE)	100 MG	ORAL	BID (09 17)	01/26/ 2015 22: 37	02/25/ 2015 17: 00
DONEPEZIL (ARICEPT)	10 MG	ORAL	DAILY (0900)	01/26/ 2015 22: 46	02/25/ 2015 09: 00
HEPARIN 5,000 UNIT/ML (HEPARIN 5,000 UNIT/ML)	5000 UNIT	ZPYXVEND	ZPYXISVE ND	01/26/ 2015 20: 26	01/26/ 2015 20: 26
HEPARIN 5,000 UNIT/ML (HEPARIN 5,000 UNIT/ML)	5000 UNIT	SUBCUTAN	ONETIME	01/26/ 2015 22: 38	01/26/ 2015 22: 38
INSULIN LISPRO (HumaLOG)	8 UNIT	SUBCUTAN	ONETIME	01/26/ 2015 22: 47	01/26/ 2015 22: 47
MAGNESIUM HYDROXIDE (MOM) (MILK OF MAGNESIA (MOM))	2400 MG	ORAL	DAILYPRN	01/26/ 2015 22: 38	02/25/ 2015 22: 37
ONDANSETRON (ZOFRAN)	4 MG	INTRAVEN OU	Q8HPRN	01/26/ 2015 22: 37	02/25/ 2015 22: 36
PHARMACY INTERVENTION NOTE (PHARMACY INTERVENTION NOTE)	1 EACH	ORAL	PER PROTOCOL	01/26/ 2015 22: 45	02/25/ 2015 22: 44
PYRIDOXINE (VITAMIN B6)	50 MG	ORAL	DAILY (0900)	01/26/ 2015 22: 47	02/25/ 2015 09: 00
SENNOSIDES (SENNA)	17.2 MG	ORAL	QHS (2100)	01/26/ 2015 22: 37	02/25/ 2015 21: 00
SODIUM PHOSPATE, MONO-DI-BASIC (FLEET ADULT ENEMA)	133 ML	RECTAL	DAILYPRN	01/26/ 2015 22: 38	02/25/ 2015 22: 37
morphine (morphine)	4 MG	ZPYXVEND	ZPYXISVE ND	01/26/ 2015 10: 07	01/26/ 2015 10: 07
morphine (morphine)	4 MG	ZPYXVEND	ZPYXISVE ND	01/26/ 2015 16: 12	01/26/ 2015 16: 12
traMADol (ULTRAM)	100 MG	ORAL	Q4HPRN	01/26/ 2015 22: 37	02/25/ 2015 22: 36
traMADol (ULTRAM)	50 MG	ORAL	Q4HPRN	01/26/ 2015 22: 37	02/25/ 2015 22: 36

ALLERGIES

DRUG ALLERGIES/ADR FROM PHARMACY

Name	Status	Reactions	Severity
No Known Drug Allergies			

FAMILY HISTORY/SOCIAL HISTORY

FAMILY HISTORY
Father died from coronary artery disease in his 70s
Brother had a CABG in his 70s

SOCIAL HISTORY
Tobacco Use: never smoked

EtOH: no

Drug use: no

Marital status: Widowed
Living environment: home
Occupation: [redacted]
ADLs: independent

REVIEW OF SYSTEMS

REVIEW OF SYSTEMS
GENERAL: DENIES: Fevers; Weight changes; Fatigue; Appetite changes
RESPIRATORY: DENIES: Cough
CARDIOVASCULAR: DENIES: Chest pain
ABDOMINAL: DENIES: Abdominal pain; Nausea; Vomiting
SKIN: DENIES: Rashes
HEMATOLOGIC / LYMPHATIC: DENIES: Anemia
ALLERGIC / IMMUNOLOGIC: DENIES: Seasonal / environmental changes
EYES: DENIES: Diplopia
ENT: DENIES: Hearing changes
GENITOURINARY: DENIES: Hematuria
MUSCULOSKELETAL: REPORTS: Joint pain
ENDOCRINE: DENIES: Heat intolerance; Cold intolerance
PSYCHIATRIC: DENIES: Depression
NEUROLOGIC: DENIES: Headache

PHYSICAL EXAM

VITALS

Name	01/26 21:34
Temp	36.70
Temp Site	Oral
Pulse	79
Pulse Site 1	Monitor
BP	142/71
BP Site	Left Arm
BP Position	Lying
RR	18
Pulse Ox	100
O2 Delivery Device	Room Air

PHYSICAL EXAM SYSTEMS
GENERAL: No apparent distress
EYES / ENT: Pupils equal, round, and react to light; Extraocular movements intact; Conjunctivae non-ictereric
LYMPHATIC: No lymphadenopathy neck
RESPIRATORY: Clear to auscultation, no wheezing, rales or rhonchi
CARDIOVASCULAR: soft systolic ejection murmur heard over the cardiac apex, otherwise patient has an irregular rhythm with stable rate; No JVD
SKIN: No rash, jaundice, ecchymosis or ulcers
ABDOMINAL: Normoactive bowel sounds; Non-tender, no masses, not distended, no rebound, no guarding
MUSCULOSKELETAL: patient's right arm is currently in a sling
NEUROLOGIC: Alert oriented x 3; No gross deficits

LABORATORY/STUDIES

METABOLICS COMMON

Name	Range	01/26 20:40
NA	135-145	138
K	3.5-5.3	4.9
CL	97-110	104
CO2	24-32	26
Anion Gap	5-15	8
Glu	70-99	202
BUN	7-23	31
Creat	0.60-1.30	1.20
GFR	>60	57

CA	8.7-10.7	9.0

CBC/DIFF

Name	Range	01/26 20:44
WBC	4.3-10.3	8.3
RBC	4.40-6.00	2.94
HGB	14.0-18.0	10.0
HCT	42.0-52.0	30.1
MCV	82.0-101.0	102.4
PLT	140-440	201
NE	43.0-72.0	81.8
LY	18.0-43.0	11.2
MO	4.0-12.0	5.7
EO	0.0-8.0	0.4
BA	0.0-2.0	1.0

COAG

Name	Range	01/27 01:13
PT	9.6-12.4	11.8
INR	2.0-3.5	1.1
PTT	23.0-32.0	27.0

RADIOLOGY
01/26/2015 10:48 Humerus-Right Min 2 Views

[redacted]
Patient: [redacted]
DOB: [redacted]
SEX: M

Requested by: [redacted]
Reason for Study: Pain
Exam Date/Time: 01/26/2015 10:48
Exam Type: Humerus-Right Min 2 Views
Pregnancy:

EXAMINATION:
Xray right shoulder, 3 views
X-ray right humerus, 2 views
X-ray right elbow, 2 views

INDICATION:
Right arm injury, pain

TECHNIQUE:
Three views right shoulder: AP internal, AP external and axillary
Two views right humerus: AP and lateral
Two views right elbow: AP and lateral

COMPARISON:
None

FINDINGS:
The bones are diffusely demineralized. There is an oblique, displaced and impacted and fracture of the humeral neck with complete anterior and proximal displacement of the distal component. The articular surface of the humeral head remains congruent with the glenoid. The distal portions of the humerus and elbow are intact. It there is no elbow joint effusion. The soft tissues are unremarkable.

IMPRESSION:
Displaced, impacted humeral neck fracture.

COMMUNICATION:
Per this written report.

STAFF: [redacted]

ECG
89 year old male with a past history of CAD, T2DM, and MDS who presents with a right humerus fracture.
Date of injury: 01/26/2015
Type of injury: Other

1; Right Humerus Fracture

ASSESSMENT / PLAN: The patient has a right humerus fracture, currently on orthopedic service with plans to have patient taken to OR in the AM. In regards to the patient's RCRI score he has a score of 1 for having a prior NSTEMI. He does not have insulin dependent diabetes, chronic kidney disease, no CVA history, no documented CHF history. The patient also demonstrates to have at least 4 METS given his workload that he does at home.

RECOMMENDATIONS
According to RCRI score patient has a 1% risk of peri-operative cardiac risk
ATTENDING COMMENTS: agree, no further cardiac WU prior to surgery.

2; Coronary Artery Disease

ASSESSMENT / PLAN: The patient reported has a history of left circumflex territory MI in 2000. The patient is managed chronically with atenolol, aspirin, and atorvastatin.

RECOMMENDATIONS
Continue home medications
ATTENDING COMMENTS: agree

3; Type II Diabetes

ASSESSMENT / PLAN: The patient has a history of T2DM on oral medications only.

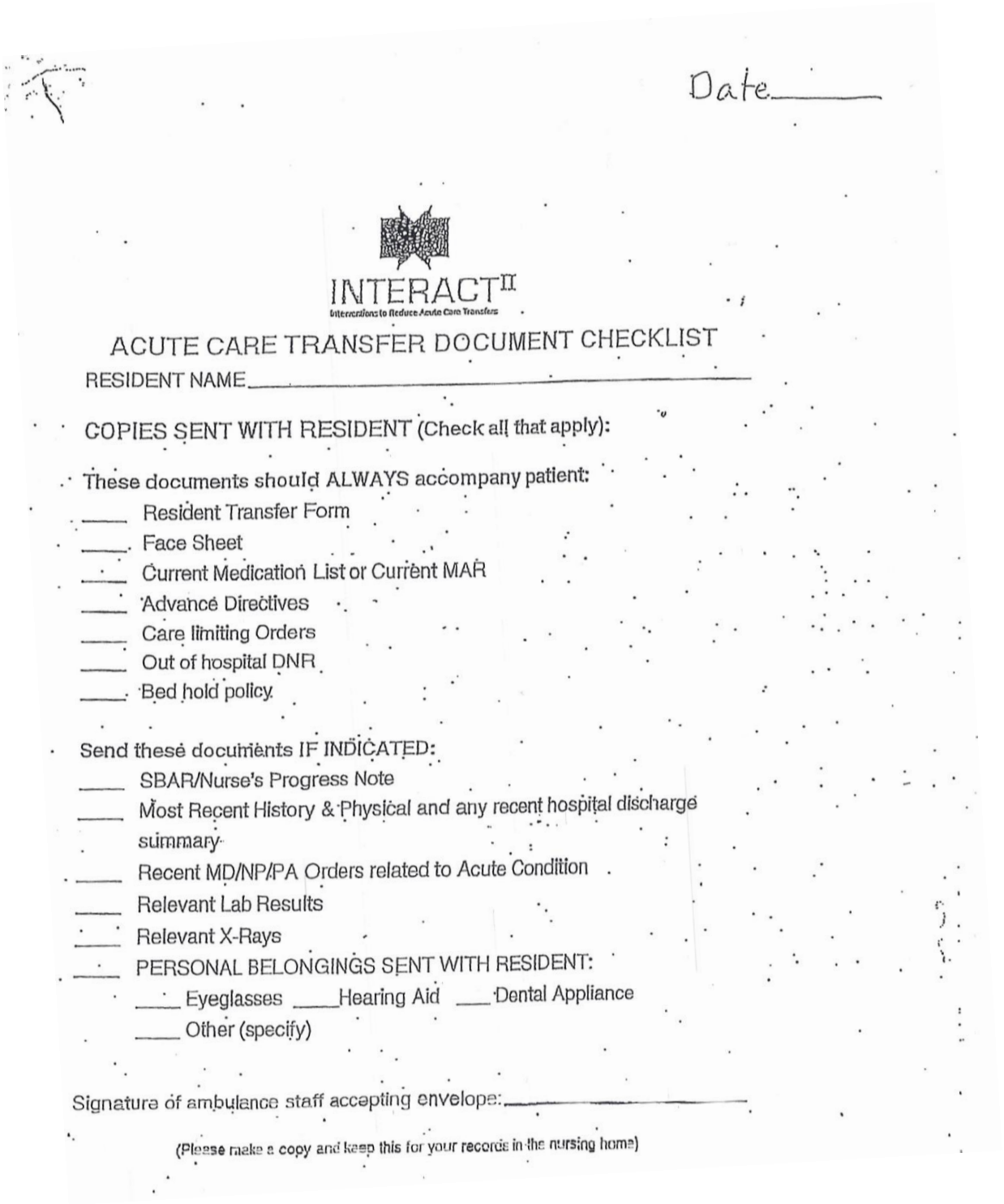
PLAN
Switch to insulin sliding scale, can restart home meds at discharge.
ATTENDING COMMENTS: agree

Limitations of Treatment: Full Code
IMPRESSION
PROBLEM LIST/PLAN OF CARE
GLOBAL PLAN OF CARE
COMMUNICATION
Discussed Plan of Care with Patient/Family: True
Referring [redacted]
Primary Ca[redacted]
ATTENDING PHYSICIAN BILLING DOCUMENTATION
Patient Status in System: I

BILLING DOCUMENTATION
Type of Services Billed: Consultation Services - Other Than Admitting Provider

Date of Service Attestation: I attest that the Date of Service accurately reflects the date that the documented services were performed
SIGNATURES
Resident Signature: Electronically[redacted]
47 PM
Attending Attestation: I saw and evaluated the patient. I agree with or have edited the findings and the plan of care as documented in the resident's note.: GC
Attending Signature: Electroni[redacted]
4:35 AM

Appendix B: Current Interact Transfer Form



Date_____

INTERACT II
Interventions to Reduce Acute Care Transfers

ACUTE CARE TRANSFER DOCUMENT CHECKLIST

RESIDENT NAME_____

COPIES SENT WITH RESIDENT (Check all that apply):

These documents should ALWAYS accompany patient:

____ Resident Transfer Form
____ Face Sheet
____ Current Medication List or Current MAR
____ Advance Directives
____ Care limiting Orders
____ Out of hospital DNR
____ Bed hold policy

Send these documents IF INDICATED:

____ SBAR/Nurse's Progress Note
____ Most Recent History & Physical and any recent hospital discharge summary
____ Recent MD/NP/PA Orders related to Acute Condition
____ Relevant Lab Results
____ Relevant X-Rays
____ PERSONAL BELONGINGS SENT WITH RESIDENT:
____ Eyeglasses ____Hearing Aid ___Dental Appliance
____ Other (specify)

Signature of ambulance staff accepting envelope:_____

(Please make a copy and keep this for your records in the nursing home)

RESIDENT TRANSFER FORM

INTERACT II

SENT TO: *(Name of Hospital)*

SENT FROM: *(Name of Nursing Home)*

Date:__/__/__ Unit:

RESIDENT:
Last Name *First Name* *MI*

DOB:__/__/__
Language: ☐English ☐Other:__
Resident is: ☐SNF/rehab ☐Long-term

CONTACT PERSON:
(Relative, guardian or DPOA/Relationship)
name
Is this the health care proxy? ☐Yes ☐No
Telephone:( )__-__
Notified of transfer: ☐Yes ☐No
Aware of diagnosis: ☐Yes ☐No

CODE STATUS:
☐DNR ☐DNH ☐DNI ☐Full Code

MD/NP/PA IN NURSING HOME:
☐MD ☐NP ☐PA
name
Telephone:( )__-__ Pager:( )__-__

WHO TO CALL TO GET QUESTIONS ANSWERED ABOUT THE RESIDENT?
name *title* Telephone:( )__-__

REASON FOR TRANSFER *(i.e., What Happened?)*

List of Diagnoses:__

VS: BP__ HR__ RR__ T__ pOx__ FS glucose__ Time Taken:__:__ AM/PM
Allergies:__ Tetanus Booster *(date)*:__/__/__

Usual Mental Status:
☐Alert, oriented, follows instructions
☐Alert, disoriented, but can follow simple instructions
☐Alert, disoriented, but cannot follow simple instructions
☐Not alert

Usual Functional Status:
☐Ambulates independently
☐Ambulates with assistance
☐Ambulates with assistive device
☐Not ambulatory

Please see SBAR form for additional information

DEVICES / SPECIAL TREATMENTS:
☐IV/PICC line
☐Pacemaker
☐Foley Catheter
☐Internal Defibrillator
☐TPN
☐Other:__

AT RISK ALERTS:
☐None ☐Seizure
☐Falls ☐Harm to:
☐Pressure Ulcer ☐Self ☐Others
☐Restraints
☐Aspiration ☐Limited/non-weight bearing: ☐Left ☐Right
☐Wanderer
☐Elopement ☐Other:__

ISOLATION / PRECAUTION:
☐MRSA ☐VRE
☐C-Diff
☐Other:__
Site:__
Comment:__

CAPABILITIES OF THE NURSING HOME TO CARE FOR THIS RESIDENT:
☐IVF therapy ☐IV antibiotics ☐MD/NP/PA follow up visit within 24 hours
☐Q shift monitoring by an RN ☐Other:__

NURSING HOME WOULD BE ABLE TO ACCEPT RESIDENT BACK UNDER THE FOLLOWING CONDITIONS:
☐ED determines diagnosis, and treatment can be done in NH ☐VS stabilized and follow up plan can be done in NH
☐Other:__

Form Completed By:
name *title* *signature*
Report Called In By:
name *title*
Report Called To:
name *title*

RESIDENT TRANSFER FORM

ADDITIONAL INFORMATION
(may be faxed to ED/hospital within 7-12 hours)

INTERACT II

RESIDENT NAME:
Last: _____ *First:* _____ *MI:* ____ *DOB:* ____/____/____

Date Transferred to the Hospital: ____/____/____

TREATMENTS AND FREQUENCY:
(include special treatments such as dialysis, chemo-therapy, transfusions, radiation, TPN, hospice)
Ventilator Settings:
AC _____ Peep _____
TV _____ Oz _____
I Time _____

SKIN / WOUND CARE:
High risk for pressure ulcer: ☐ Yes ☐ No
Pressure ulcers:
(stage, location, appearance, treatments)
_____
Wound care sheet attached: ☐ Yes ☐ No

IMMUNIZATIONS:
Influenza Date: ____/____/____
Pneumococcal Date: ____/____/____
Tetanus Tet-Diphtheria Date: ____/____/____

DIET:
Needs assistance with feeding: ☐ Yes ☐ No
Trouble swallowing: ☐ Yes ☐ No
Special consistency: *(thickened liquids, crush meds, etc.)*
_____
Tube feeding: ☐ Yes ☐ No

PHYSICAL THERAPY
Resident is receiving therapy with goal of returning home: ☐ Yes ☐ No
- or -
Patient is LTC placement: ☐ Yes ☐ No
Weight bearing status:
☐ Non-weight ☐ Partial weight ☐ Full weight
Fall risk: ☐ Yes ☐ No
Interventions: _____

ADLs:
(mark I=independent; D=dependent; A=needs assistance)
____ Bathing
____ Dressing
____ Toileting/Transfers
____ Ambulation
____ Eating
____ Can ambulate _____ (distance) with _____ (assistive device or I)

DISABILITIES:
(amputation, paralysis, contractures)

IMPAIRMENTS:
(cognitive, speech, hearing, vision, sensation)

CONTINENCE:
☐ Bowel ☐ Bladder
Last bowel movement:
Date: ____/____/____

BEHAVIORAL or SOCIAL ISSUES and INTERVENTIONS:

FAMILY ISSUES:

PAIN ASSESSMENT:

SOCIAL WORKER:
_____ *name*
Telephone: (508) 829 - 1202

REASON FOR ORIGINAL SNF ADMISSION:
_____
Bed hold: ☐ Yes ☐ No

Appendix C: Updated Interact Transfer Form

Acute Care Transfer Document Checklist

INTERACT® Version 4.0 Tool

Resident Name _____

Facility Name _____ **Tel** _____

Copies of Documents Sent with Resident *(check all that apply)*

Documents Recommended to Accompany Resident

_____ Resident Transfer Form

_____ Face Sheet

_____ Current Medication List or Current MAR

_____ SBAR and/or other Change in Condition Progress Note *(if completed)*

_____ Advance Directives *(Durable Power of Attorney for Health Care, Living Will)*

_____ Advance Care Orders *(POLST, MOLST, POST, others)*

Send These Documents *if indicated*:

_____ Most Recent History and Physical

_____ Recent Hospital Discharge Summary

_____ Recent MD/NP/PA and Specialist Orders

_____ Flow Sheets *(e.g. diabetic, wound care)*

_____ Relevant Lab Results *(from the last 1-3 months)*

_____ Relevant X-Rays and other Diagnostic Test Results

_____ Nursing Home Capabilities Checklist *(if not already at hospital)*

Sent with resident ___ Eyeglasses ___ Hearing Aid ___ Other (specify) _____

Emergency Department:

Please ensure that these documents are forwarded to the hospital unit if this resident is admitted. Thank you.

EMT Signature *(optional)* _____

Nursing Home to Hospital Transfer Form

INTERACT®
Version 4.0 Tool

Resident Name *(last, first, middle initial)* _____
Language: ☐ English ☐ Other _____ Resident is: ☐ SNF/rehab ☐ Long-term
Date Admitted *(most recent)* _____/_____/_____ DOB _____/_____/_____
Primary diagnosis(es) for admission _____

Sent To *(name of hospital)* _____
Date of transfer _____/_____/_____
Sent From *(name of nursing home)* _____ Unit _____

Contact Person _____
Relationship *(check all that apply)*
☐ Relative ☐ Health care proxy ☐ Guardian ☐ Other
Tel (_____) _____
Notified of transfer? ☐ Yes ☐ No
Aware of clinical situation? ☐ Yes ☐ No

Who to Call at the Nursing Home to Get Questions Answered
Name / Title _____
Tel (_____) _____

Primary Care Clinician in Nursing Home ☐ MD ☐ NP ☐ PA
Name _____
Tel (_____) _____

Code Status ☐ Full Code ☐ DNR ☐ DNI ☐ DNH ☐ Comfort Care Only ☐ Uncertain

Key Clinical Information
Reason(s) for transfer _____
Is the primary reason for transfer for diagnostic testing, not admission? ☐ No ☐ Yes Tests: _____
Relevant diagnoses ☐ CHF ☐ COPD ☐ CRF ☐ DM ☐ Ca *(active treatment)* ☐ Dementia ☐ Other _____
Vital Signs BP _____ HR _____ RR _____ Temp _____ O2 Sat _____ Time taken *(am/pm)* _____
Most recent pain level _____ (☐ N/A) Pain location: _____
Most recent pain med _____ Date given _____/_____/_____ Time *(am/pm)* _____

Usual Mental Status:
☐ Alert, oriented, follows instructions
☐ Alert, disoriented, but can follow simple instructions
☐ Alert, disoriented, but cannot follow simple instructions
☐ Not Alert

Usual Functional Status:
☐ Ambulates independently
☐ Ambulates with assistive device
☐ Ambulates only with human assistance
☐ Not ambulatory

Additional Clinical Information:
☐ SBAR Acute Change in Condition Note included
☐ Other clinical notes included
For residents with lacerations or wounds:
Date of last tetanus vaccination *(if known)* _____/_____/_____

Devices and Treatments
☐ O2 at _____ L/min by ☐ Nasal canula ☐ Mask (☐ Chronic ☐ New)
☐ Nebulizer therapy; (☐ Chronic ☐ New)
☐ CPAP ☐ BiPAP ☐ Pacemaker ☐ IV ☐ PICC line
☐ Bladder (Foley) Catheter (☐ Chronic ☐ New) ☐ Internal Defibrillator
☐ Enteral Feeding ☐ TPN ☐ Other _____

Isolation Precautions
☐ MRSA ☐ VRE
Site _____
☐ C. difficile ☐ Norovirus
☐ Respiratory virus or flu
☐ Other _____

Allergies
_____
_____
_____
_____
_____

Risk Alerts
☐ Anticoagulation ☐ Falls ☐ Pressure ulcer(s) ☐ Aspiration ☐ Seizures
☐ Harm to self or others ☐ Restraints ☐ Limited/non-weight bearing: (☐ Left ☐ Right)
☐ May attempt to exit ☐ Swallowing precautions ☐ Needs meds crushed
☐ Other _____

Personal Belongings Sent with Resident
☐ Eyeglasses ☐ Hearing Aid
☐ Dental Appliance ☐ Jewelry
☐ Other _____
_____

Nursing Home Would be able to Accept Resident Back Under the Following Conditions
☐ ER determines diagnoses, and treatment can be done in NH ☐ VS stabilized and follow up plan can be done in NH
☐ Other _____

Additional Transfer Information on a Second Page:
☐ Included ☐ Will be sent later

Form Completed By *(name/title)* _____ **Signature** _____
Report Called in By *(name/title)* _____
Report Called in To *(name/title)* _____ Date _____/_____/_____ Time *(am/pm)* _____

Nursing Home to Hospital Transfer Form *(additional information)*

INTERACT® Version 4.0 Tool

Not critical for Emergency Room evaluation; may be forwarded later if unable to complete at time of transfer.

RECEIVER: PLEASE ENSURE THIS INFORMATION IS DELIVERED TO THE NURSE RESPONSIBLE FOR THIS PATIENT

Resident Name *(last, first, middle initial)* _____

DOB ____/____/____ Date transferred to hospital ____/____/____

Contact at Nursing Home for Further Information

Name / Title _____

Tel (____) _____

Social Worker

Name _____

Tel (____) _____

Family and Other Social Issues *(include what hospital staff needs to know about family concerns)* _____

Behavioral Issues and Interventions

Primary Goals of Care at Time of Transfer

☐ Rehabilitation and/or Medical Therapy with intent of returning home

☐ Chronic long-term care

☐ Palliative or end-of-life care

☐ Receiving hospice care ☐ Other _____

Treatments and Frequency *(include special treatments such as dialysis, chemotherapy, transfusions, radiation, TPN)*

Diet

Needs assistance with feeding? ☐ No ☐ Yes

Trouble swallowing? ☐ No ☐ Yes

Special consistency *(thickened liquids, crush meds, etc…)?* ☐ No ☐ Yes

Enteral tube feeding? ☐ No ☐ Yes *(formula/rate)* _____

Skin/Wound Care

Pressure Ulcers *(stage, location, appearance, treatments)*

Immunizations

Influenza:

Date ____/____/____

Pneumococcal:

Date ____/____/____

Physical Rehabilitation Therapy

Resident is receiving therapy with goal of returning home? ☐ No ☐ Yes

Physical Therapy: ☐ No ☐ Yes

Interventions _____

Occupational Therapy: ☐ No ☐ Yes

Interventions _____

Speech Therapy: ☐ No ☐ Yes

Interventions _____

ADLs Mark I = Independent D = Dependent A = Needs Assistance

Bathing _____ Dressing _____ Transfers _____

Toileting _____ Eating _____

☐ Can ambulate independently _____

☐ Assistive device *(if applicable)* _____

☐ Needs human assistance to ambulate _____

Impairments – General

☐ Cognitive ☐ Speech ☐ Hearing

☐ Vision ☐ Sensation

☐ Other _____

Impairments – Musculoskeletal

☐ Amputation ☐ Paralysis ☐ Contractures

☐ Other _____

Continence

☐ Bowel ☐ Bladder

Date of last BM ____/____/____

Additional Relevant Information _____

Form Completed By *(name/title)* _____

If this page sent after initial transfer: Date sent ____/____/____ Time *(am/pm)* _____

Signature _____