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# Telemedicine Enhances Communication in the Intensive Care Unit

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TELEMEDICINE ENHANCES COMMUNICATION IN THE INTENSIVE CARE  
UNIT

A Dissertation Presented

by

Prema R. Menon

to

The Faculty of the Graduate College

of

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## ABSTRACT

Patients admitted to the Intensive Care Unit (ICU) are critically ill and often at extremely high risk of death. These patients receive aggressive interventions to prolong their lives. Despite these measures, many patients still succumb to their illness. Although ICU physicians are good at predicting which patients have a high risk of mortality, they are still offering interventions that do not prolong life, but potentially cause more suffering at the end of life. This is because there is a lack of high quality and early communication to discuss prognosis and establish patients' goals of care. This gap in communication is even more profound when patients are transferring from rural hospitals to busy tertiary care centers.

This dissertation discusses the utilization of tele-video conferencing to enhance early communication with family members/loved ones of critically ill patients prior to their transfer from a rural hospital to a tertiary care center. It begins with a description of telemedicine and its uses in the ICU to date. Chapter 2 discusses the poor prognoses of patients receiving high intensity interventions such as cardiopulmonary resuscitation (CPR). The extremely dismal outcomes underscore the importance of early, thorough discussions regarding prognosis and goals of care in these patients. The next chapter describes a pilot study utilizing telemedicine to conduct formal unstructured telemedicine conferences with family members prior to transfer. This study demonstrated that palliative care consultations can be provided via telemedicine for critically ill patients and that adequate preparation and technical expertise are essential. Although this study is limited by the nature of the retrospective review, it is evident that more research is needed to further assess its applicability, utility and acceptability. Chapter 4 describes an investigation into the barriers and facilitators of conducting conferences via telemedicine and the perceptions of clinicians regarding the use of telemedicine for this purpose. This chapter identified unique barriers and facilitators to the use of telemedicine that will need to be addressed when designing a telemedicine intervention for conducting family conferences.

This thesis describes the importance and process of implementation of telemedicine for the novel purpose of enhancing early communication among physicians and family members of critically ill loved ones. Further studies are needed to refine and investigate patient and family centered clinical outcomes utilizing this intervention.

## CITATIONS

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## DEDICATION

To my three amazing daughters (Ivy, Rani and Devi) and the incredible man they are lucky to call their father- Jos. Thank you all for being my biggest supporters and for making every day so tremendously meaningful. I love you.

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## TABLE OF CONTENTS

	Page
CITATIONS .....	ii
DEDICATION.....	iii
ACKNOWLEDGEMENTS.....	iv
LIST OF TABLES.....	vii
<b>CHAPTER 1: TELEMEDICINE IN THE INTENSIVE CARE UNIT.....</b>	<b>1</b>
1.1 Introduction.....	1
1.2 Current Uses of Telemedicine in the ICU.....	2
1.3 Telemedicine for Communication .....	4
1.4 Barriers and Facilitators to Telemedicine in the ICU.....	5
1.5. Early Communication in the ICU using Telemedicine.....	9
1.6 Conclusions.....	9
References.....	10
<b>CHAPTER 2: MULTIPLE IN-HOUSE RESUSCITATION EFFORTS IN THE ELDERLY.....</b>	<b>15</b>
2.1 Abstract.....	15
2.2 Background.....	16
2.3 Methods.....	17
2.4 Analysis.....	17
2.5 Results.....	20
2.6 Discussion.....	22
2.7 Conclusions.....	26
References.....	34

<b>CHAPTER 3: TELEMEDICINE AS A TOOL TO PROVIDE FAMILY CONFERENCES AND PALLIATIVE CARE CONFERENCES IN CRITICALLY ILL PATIENTS IN RURAL HEALTH CARE INSTITUTIONS: A PILOT STUDY</b> .....	36
3.1 Abstract.....	36
3.2 Background.....	37
3.3 Methods.....	39
3.4 Results.....	41
3.5 Discussion.....	42
3.6 Conclusions.....	46
References.....	54
<b>CHAPTER 4: CLINICIANS' PERCEPTIONS OF TELMEDICINE FOR CONDUCTING FAMILY CONFERENCES PRIOR TO TRANSFER TO A TERTIARY CARE CENTER INTENSIVE CARE UNIT</b> .....	56
4.1 Abstract.....	56
4.2 Background.....	57
4.3 Methods.....	59
4.4 Analysis.....	60
4.5 Results.....	61
4.6 Discussion.....	66
4.7 Conclusions.....	69
References.....	72
COMPREHENSIVE BIBLIOGRAPHY.....	74



## LIST OF TABLES

	Page
<b>CHAPTER 2</b>	
Table 2.1 Survival to discharge by patient and hospital characteristics and number of CPR events during a single hospitalization .....	28
Table 2.2 Multivariable analyses of factors associated with survival to discharge in patients with more than one CPR event during a single hospitalization .....	31
Table 2.3 Discharge destination for survivors of CPR events during the index hospitalization .....	32
Table 2.4 Multivariable analyses of number of CPR events and other factors associated with survival to discharge.....	33
<b>CHAPTER 3</b>	
Table 3.1 Patient and Conference Descriptions.....	47
<b>CHAPTER 4</b>	
Table 4.1 Codebook for analyzing survey Results .....	71

## Chapter 1: Telemedicine in the Intensive Care Unit

### 1.1 Introduction:

Each year, approximately 6 million people in the U.S. are admitted to an Intensive Care Unit (ICU), accounting for about 30% of total hospital costs[1]. Patients admitted to the ICU have an extremely high risk of morbidity and mortality, with a mortality rate of approximately 10% or 540,000 deaths annually [1, 2]. Although interventions such as establishing best practices and implementation of novel technologies with ICUs have led to improvement in mortality, overall ICU mortality remains high. Many studies have demonstrated that the majority of deaths in the ICU involve withholding or withdrawing life-sustaining therapies [3-11]. Therefore the ICU represents a setting where, in addition to decisions about acute life-sustaining therapies, decisions about managing death and dying are frequently made. Several studies have shown that family members rate communication with health care providers as one of the most important factors of care. In fact, most families rate communication skills as equal to or more important than clinical skills [12, 13]. Effective communication is crucial for excellent ICU care, and research demonstrates that high quality early communication in the ICU improves family satisfaction, perceived quality of death and dying among family members whose loved ones died in an ICU, reduces symptoms of depression, and decreases costs [14-16]. Despite the robust evidence supporting high quality communication, most ICU physicians do not conduct family conferences until shortly before the decision is made to withhold/withdraw life sustaining therapies, and many physicians remain uncomfortable beginning these discussions early in an ICU stay [17-19]. In addition, there is an even larger communication gap among family members of patients who are transferring from a

rural hospital to a larger tertiary care center ICU. Long distances, financial restrictions, and other responsibilities often impair the ability of family members to travel to a tertiary care center to participate in ICU family conferences, and thus communication with families of patients who transfer very rarely occurs early in these patients' care.

Telemedicine is defined as the delivery of health care services or the transmission of health care information using telecommunications technology [20]. NASA first introduced telemedicine in the 1960s to gather physiologic data from astronauts in space [21, 22]. It has since evolved to provide medical care from a distance to underserved areas and to provide subspecialty services to smaller hospitals. The use of telemedicine in rural and underserved areas has been shown to effectively address specific issues that rural physicians often encounter including, isolation, poor communication, lack of onsite specialists and limited or no access to current medical information and continuing medical education [23, 24]. In addition, utilization of telemedicine has been shown to improve patients' perceptions of the quality of care received and to decrease the financial impact of illness because they do not need to transfer to another facility to receive subspecialty services [25, 26]. Telemedicine may be able to provide effective early communication for family members of patients who transfer to tertiary care centers.

## **1.2 Current Uses of Telemedicine in the Intensive Care Unit**

Over the past several decades, there has been a rapid growth of telemedicine implementation including the use of telemedicine in critical illness, an area in which

telemedicine may substantially impact processes of care. Telemedicine was first implemented in the ICU in response to two major areas of concern within critical care medicine: heterogeneous critical care delivery and work force shortage. It is estimated that high variability in critical care delivery due to varying organizational structures across organizations within the health care system may be responsible for more than 100,000 preventable annual deaths due to inconsistent implementation of best practices [27]. As the U.S. population continues to age, the need for ICU providers has risen significantly, leading to a shortage of critical care providers[28]. According to a 2006 Health Resources and Services Administration study, the US will need 4,300 critical care physicians by 2020 with a predicted shortfall of 1,500 intensivists nationally[29]. This led to the implementation of telemedicine in the ICU, begun in an effort to improve overall processes in ICU care.

Tele-ICU or e-ICU is the provision of critical care by a team via a computer and audiovisual or telecommunication system [30]. In its most common form, ICU telemedicine involves remote monitoring of ICU patients using fixed installations. Monitoring occurs either continuously or only during the nighttime hours, when physicians may not be present at the bedside but can monitor critically ill patients remotely[31].

Tele-ICU care (remote monitoring of ICU patients by trained intensivists) has been shown to decrease overall length of stay (LOS) in the ICU. Several studies have shown a reduction in ICU LOS from 1-2 days [2, 32-36]. Studies investigating the relationship of telemedicine utilization to ICU mortality have demonstrated mixed results, with some

studies finding a significant improvement and others finding no change in mortality [2, 32-35, 37-41]. In addition to ICU LOS and potentially mortality, tele-ICU has led to improved overall quality of care due in large part to improved adherence to best practices such as protocol based management of sepsis, low tidal volume ventilation strategies, and prevention of ventilator associated complications in the ICU [37, 42-44]. At present, tele-ICU is the most commonly used application of telemedicine in the ICU. There are several additional examples of utilizing telemedicine to provide education to rural hospitals from larger academic health centers. These include teaching case conferences and discussions. Telemedicine is also used to provide “virtual” consultations. In these instances, telemedicine is used to discuss cases among providers with subsequent recommendations for care without actively involving nurses or patients [45]. Within pediatric ICUs, telemedicine is used to connect children with their family members who are unable to be present due to long distances or who need to continue to go to work. Telemedicine with videoconferencing has provided a practical solution to these barriers that limit family presence and participation in care [46].

### **1.3 Telemedicine for Communication**

Telemedicine has been used in the non-ICU setting for the purposes of teleconsultations in a variety of medical specialties including radiology, dermatology, surgery, pediatrics and psychiatry [47-49]. In most of these consultative processes, communication through telemedicine is most often physician centered. In telepsychiatry and telepsychology, however, an emphasis is placed on increasing patient communication and improving physician awareness and response to verbal and non-verbal cues. There have been many

studies that have evaluated the efficacy of telemedicine to assist in communication with patients [47, 50]. In addition, other studies have investigated the role of communication and the development of an effective therapeutic alliance between patient and a health care professional. These studies have found that both effective communication and development of a therapeutic alliance rely heavily on the experiences of the patient during their first telemedicine encounters. Patients who felt they had adequate time to talk and ask questions, did not feel rushed, and felt they were heard had higher rates of satisfaction with the telemedicine experience [51]. Likewise, patients who received interventions via telemedicine did not report any difference in the experience compared to in-person communication interventions [52]. Although these studies were performed in the outpatient specialty setting (psychology and pulmonary), these data demonstrate that communication through telemedicine, when performed optimally, is feasible and acceptable to patients. In spite of the importance of communication in the ICU, there are no published evaluations of tele-ICU for improving communication with family members of patients who cannot be present for an early family conference.

#### **1.4 Barriers and facilitators to telemedicine in the ICU**

Although telemedicine has been in existence in various forms since the 1970s, it was not introduced widely in the ICU until 2000 and meaningful adoption did not begin until 2003 [2, 53]. The overall number of ICU beds covered by telemedicine increased from 0.4% to 7.9% between 2003 and 2010. Most of that growth occurred between 2003 and 2007 (annual rate of growth of 101.1% per year) compared to 2008-2010 where the average rate of growth was 8.1% per year [54]. This slowing growth is likely not due to

the technology reaching its saturation point, but rather because the majority of hospitals with ICU telemedicine capabilities are large teaching hospitals in metropolitan areas, suggesting there remains a large number of smaller rural hospitals that have not adopted this novel technology [54, 55]. The reasons for the lag in adoption remain unclear but may include barriers to implementation such as high cost, lack of staffing capabilities, and negative perceptions of telemedicine. The recent decline in utilization of telemedicine has made investigating user acceptance an increasingly critical technology implementation and management issue. Previous investigations have studied telemedicine through the technology assessment model (TAM), an information systems theory that models how users come to accept and use a technology [56]. This model incorporates perceived usefulness, perceived ease of use, attitude toward use, behavioral intention to use, and other external variables to evaluate actual system use [57, 58]. One study applying the TAM model specifically towards telemedicine found that perceived usefulness was the most significant factor affecting acceptance. Attitude towards telemedicine was also considered an important factor, but has not been fleshed out in its entirety. Interestingly, perceived ease of use was considered significantly less important [59]. Other studies have looked at costs, perceptions and other barriers independent of the TAM model.

Costs of tele-ICU: It has been estimated that full implementation of a tele-ICU system in community hospitals nationwide could prevent between 5,400 and 13,400 deaths and potentially save \$5.4 billion annually [60-62]. However, one of the primary barriers to disseminated adoption has been the cost of implementation. These costs include

construction, installation and training at a minimum. The average cost of implementing a tele-ICU system is \$50,000-\$100,000 per bed (approximately \$2-\$3 million per institution) including annual operating costs of about \$300,000-\$1 million. Several studies have suggested that the initial set up and annual operating costs are offset by approximately \$1-2 million in net savings annually [63, 64]. These savings come from overall decreased ICU LOS, and adherence to best practices including avoidance of iatrogenic complications, stewardship of antibiotics, and decreased blood transfusions.

Perceptions: The interpersonal dynamics of ICU staff are influenced by the use of tele-ICU for monitoring and intervention by specialists. Staff impact is important, as perceptions and perceived benefits of tele-ICU coverage are important for implementation, operating, and maintaining a tele-ICU system. Overall general acceptance of telemedicine technology in the ICU setting is favorable [65-69]. Many studies have evaluated pre- and post- implementation acceptance of tele-ICU coverage. One study evaluating nurses' pre-implementation perceptions found that on a five-point Likert scale (1= not favorable and 5= favorable) nurses perceived tele-ICU usefulness and overall attitude toward tele-ICU as average (2.8 and 3.3 respectively) [70]. However, post implementation, mean satisfaction with tele-ICU coverage ranged from 4.22 to 4.53 [65]. Another study found that prior to implementation, 67% of ICU physicians and nurses believed that tele-ICU coverage could enhance ICU quality of care, and post-implementation 82.3% reported increased quality [69, 71, 72]. Another study found that 67% of ICU staff believed tele-ICU coverage would improve communication between ICU and tele-ICU intensivists before implementation, and post implementation 94%



found that collaboration was facilitated by tele-ICU and overall communication between intensivists improved [73]. There are also data suggesting that tele-ICU care makes caring for patients in the ICU less burdensome, is encouraged and facilitated by hospital administration, and helps with recruitment and retention of healthcare professionals at smaller hospitals [74]. One small study assessed patients' and families' perceptions of care in 10 ICUs supported by tele-ICU coverage. Items with which patients and family members were most satisfied included feeling that patients were treated as individual people and that they were aware when they were being watched over. They felt that they received appropriate explanations of care and that their needs were responded to in a timely manner, suggesting that tele-ICU may also enhance patient experience in the ICU [75].

In addition to the perceived benefits of tele-ICU, several barriers to tele-ICU acceptance have been identified. Although there is considerable improvement in post-implementation perceptions, the attitudes of physicians and nurses who have not used telemedicine is a significant barrier. Moreover, there is widespread concern about privacy issues, as well as nurse and physician perceptions that tele-ICU may decrease the ability to personally know and establish a relationship with the tele-ICU staff [76]. There are also concerns about disruptions to workflows, confusion about how to use tele-ICU software and hardware, and uneasiness with unmet expectations such as how telemedicine will be rolled out, what responsibilities would change, etc. [77]. Physicians remain concerned that positive cost savings are not guaranteed and may not meaningfully affect a hospital's bottom line. Moreover, although physician reimbursement is

increasingly common, very few payers, including Medicare (the most common payer for ICU patients), reimburse for critical care services provided via telemedicine [78].

### **1.5 Early Communication in the ICU using Telemedicine**

Because communication with patients who transfer from rural hospitals to larger tertiary care center ICUs is often delayed, their families may benefit from early communication to discuss diagnosis, prognosis, goals of care and treatment plans via telemedicine. To date, there are no studies that assess the feasibility, acceptability and outcomes of using telemedicine as a tool to conduct early family conferences for ICU patients.

### **1.6 Conclusion**

In order to investigate this novel concept of utilizing telemedicine to communicate with family members of patients at rural hospitals prior to their loved one transferring to a tertiary care center, further research is needed to better understand the barriers and facilitators to utilizing telemedicine. Although there are some data about telemedicine in the ICU setting, further detailed studies that address both barriers and facilitators of using telemedicine to communicate with families are needed. These studies should incorporate the concepts of the technology acceptance model to provide the most comprehensive review of barriers and facilitators. Understanding these issues will be the key to designing, implementing and analyzing a successful and sustainable telemedicine practice.

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## Chapter 2: Multiple In-Hospital Resuscitation Efforts in the Elderly

### 2.1 Abstract

**Objective:** The objective of this study was to determine the characteristics and survival rates of patients receiving CPR more than once during a single hospitalization.

**Design:** We analyzed inpatient Medicare data from 1992-2005 identifying beneficiaries 65 years of age and older who underwent CPR more than once during the same

hospitalization. **Measurements:** We examined patient and hospital characteristics, survival to hospital discharge, factors associated with survival to discharge, median

survival, and discharge disposition. **Results:** We analyzed data from 421,394 patients who

underwent CPR during the study period. 413,403 patients received CPR once during a hospitalization and survival was 17.7% with median survival after discharge being 20.6

months. There were 7,991 patients who received CPR more than once during the same hospitalization; 8.8% survived the efforts, and median survival after leaving the hospital

was 10.5 months. Patients who received more than one episode of CPR during a hospitalization were significantly less likely to go home after discharge. Greater age,

black race, higher burden of chronic illness, and receiving CPR in a larger or

metropolitan hospital were associated with lower survival among patients receiving CPR more than once. **Conclusions:** Undergoing multiple CPR events during a hospitalization

is associated with substantially reduced short and long-term survival compared with

patients who undergo CPR once. This information may be useful to clinicians when

discussing end-of-life care with patients and families of patients who have experienced



return of spontaneous circulation following in-hospital CPR but remain at risk for recurrent cardiac arrest.

## 2.2 Background

Cardiopulmonary resuscitation (CPR) was initially developed in the 1960's primarily for patients who suffered cardiac arrest in the immediate post-operative setting[1]. Since then, multiple attempts at improving CPR delivery have occurred, [2, 3] but survival remains low. In our previous study we found an incidence of 2.73 per 1000 hospital admissions and an 18.3% survival rate to hospital discharge in patients who receive in-hospital CPR[4], which is consistent with findings over the past 50 years[5-9].

Current guidelines state that physicians should discuss patient preferences with regard to resuscitation efforts if the patient is at increased risk for cardiac or pulmonary failure[10].

While many studies have investigated outcomes after in-hospital CPR, including our recent complete epidemiologic analysis[4], there are few data available on outcomes in patients who receive multiple resuscitation efforts in the same hospitalization. A study of 197 patients found that multiple CPR efforts during a hospitalization were a predictor of death, however this was a small single center study and 27% of CPR attempts were repeat arrests occurring in patients who had already arrested at least once[11]. Our study seeks to further understand the outcomes and the patient and hospital characteristics associated with survival in patients who receive more than one CPR event during a hospitalization.

This is a commonly encountered dilemma in critical care, and this information is important to critical care clinicians so surrogate decision-makers of patients who survive the initial episode of CPR can receive appropriate counseling on the value of subsequent CPR efforts.

### 2.3 Methods

We conducted an epidemiological study using Medicare Provider Analysis and Review (MedPAR) hospital claims from 1992-2005 identifying beneficiaries in the Old Age and Survivors Insurance (OASI) program 65 years of age or older for whom a claim for payment had been made for in-hospital CPR. We then further identified those participants who had more than one CPR claim during the same hospitalization. We defined CPR by the presence of either 99.60 (cardiopulmonary resuscitation, not otherwise specified) or 99.63 (closed chest cardiac massage) based on the International Classification of Diseases, Ninth Revision (ICD-9). We excluded patients who were co-enrolled in a health maintenance organization (HMO), because such patients may have had incomplete CPR claims data. The institutional review board of the University of Vermont reviewed this study and found it exempt from the need for approval. In our prior study of the epidemiology of CPR in all older adults, these same data abstraction methods were used; hence, the datasets are very similar. For this current study, a separate new dataset was created from original MedPAR data.

### 2.4 Analysis

Our primary outcome was survival to hospital discharge among patients receiving CPR more than once in a hospitalization based upon discharge destination and date of death coded in the MedPAR file. Additional outcomes of interest included long-term survival using beneficiary date of death within MedPAR (censored at 12/31/2005) as well as discharge destination of home, another hospital, skilled nursing facility, or hospice. Because the vital status of some beneficiaries was unclear within the data, we excluded

those with a discharge destination indicating in-hospital death but who had a recorded date of death 2 or more days beyond the date of discharge, as well as those whose discharge destination indicated they were alive at discharge but for whom the recorded date of death either preceded the date of discharge or was on the date of discharge. Some beneficiaries had a discharge destination indicating in-hospital death but also had a recorded date of death one day later than the discharge date and we assumed that this discrepancy was an error in date recording and that these beneficiaries actually died on the date of discharge. These beneficiaries were included in the crude and multivariable analyses, but for survival analyses were considered to have survived 0 days beyond discharge. We compared survival among hospital discharge survivors who received one and more than one episode of CPR during the index hospitalization using the log rank test to determine a difference between the Kaplan Meier curves.

We also investigated associations between patient and facility characteristics and survival to hospital discharge among patients who received CPR more than once using multivariable logistic regression with robust standard error estimates. This multivariable model included covariates for age, sex, race, burden of chronic illness, median income, admission from a skilled nursing facility (SNF), hospitalization diagnosis codes (including myocardial infarction [MI], congestive heart failure [CHF], stroke, diabetes mellitus, chronic obstructive pulmonary disease [COPD]), hospital size, metropolitan or non-metropolitan location of the hospital, and teaching status of the hospital.

Additionally, we explored interaction terms for hospital characteristics (between teaching status and rurality, size and rurality, and teaching status and size) in our multivariable models. For all of our analyses, a complete case approach was used (excluding those

observations with missing data for any of the variables of interest). Race was categorized as black, white or other because further classification within Medicare data may not be accurate[12]. Deyo-Charlson score was used to assess the burden of chronic coexisting illness[13]. This score ranges from 0 to 33 with higher scores indicating higher burden of illness. We included it in the model as ordinal categories of 0,1, 2, or 3 or more because there were very few subjects with a score of greater than 5. Using the 1999 U.S. Census data we identified median household income according to the patient's ZIP code. We examined hospital identity using Medicare provider numbers and used data from the Centers for Medicare and Medicaid Services (CMS) to determine hospital characteristics. The location of hospitals were dichotomized as metropolitan or nonmetropolitan using the hospital ZIP codes and the Rural-Urban Commuting Area Codes, version 2.0 [12]. Additionally, we investigated the association between having undergone prior CPR during the hospitalization and survival to discharge in a cohort of all patients who received CPR using a multivariable regression model adjusting for the variables associated with survival (i.e. age, sex, race, burden of chronic illness, diagnosis and hospital characteristics). In this multivariable model, receipt of prior CPR was a dichotomous variable and distinguished patients who received CPR only once from those who received CPR more than once. We also investigated the association of CPR with survival to discharge in an additional multivariable model where CPR was categorized as ordinally as the number of events.

## 2.5 Results

We identified 433,973 patients who underwent CPR during the study period. For 12,579 of these individuals, there was discrepancy between vital status at index hospital discharge and recorded date of death, so these cases were excluded. The remaining 421,394 patients were included in subsequent analyses including the 3,622 patients with discharge destination indicating in-hospital death but with a recorded date of death one day later than the discharge date because we assumed this discrepancy related to deaths occurring late in the day. Survival to hospital discharge for the 413,403 patients who each received only one episode of CPR during a hospitalization was 17.7% (95%CI, 17.5 to 17.8). There were 7,991 patients who underwent CPR more than once during the index hospitalization, and the proportion of this group surviving to discharge was 8.8% (95% CI, 8.2 to 9.4). (Table 1) This difference in survival to hospital discharge between the two groups was statistically significant ( $p < 0.001$ ). As seen in Table 1, survival appears to be greater in patients receiving more than one CPR effort with a diagnosis of congestive heart failure (CHF) and stroke and those who receive CPR at non-metropolitan and smaller hospitals. Survival tended to be lower in patients  $>80$  years of age and non-white patients. Among those alive at hospital discharge, patients who underwent only one CPR event during the index hospitalization had a median survival of 20.6 months, whereas those with more than one episode of CPR had significantly shorter median survival of 10.5 months. ( $p < 0.001$ ).

Among the group of patients undergoing more than one episode of CPR in the hospitalization, we used multivariable logistic regression to evaluate for associations between patient and hospital factors and survival to discharge (Table 2). Age greater

than 90 years was associated with lower survival (OR 0.53 [95% CI 0.34-0.82]), as was race other than white (OR 0.51 [0.39-0.66] for black race and OR 0.57 [95% CI 0.35-0.90] for other). Additional covariates associated with reduced hospital discharge survival were Deyo-Charlson Score of 2 (OR 0.68 [95% CI 0.49-0.96]) and  $\geq 3$  (OR 0.51 [95% CI 0.34-0.76]), and hospital size of  $>450$  beds (OR 0.74 [95% CI 0.58-0.95]). None of the interaction terms or tests of collinearity between hospital teaching status, rurality and size were statistically significant (data not shown). Hospitalization diagnoses of congestive heart failure (OR 1.85 [95% CI 1.52-2.27]) and stroke (OR 1.78 [95% CI 1.34-2.36]) were associated with improved survival. Receiving CPR at a non-metropolitan hospital was also associated with a trend toward improved survival (OR 1.25 [95% CI 0.99-1.55],  $p=0.052$ ).

In a multivariable logistic regression model of the entire cohort of patients who received CPR during the study period (378,309 who received CPR one or more times and who had no missing data points) adjusted for patient and hospital factors known to be associated with lower survival as well as a variable indicating that a patient had more than one episode of CPR during the index hospitalization, we found that having had prior CPR was associated with almost 60% lower adjusted odds of survival (OR 0.42 [95% CI 0.38-0.45]). Of the patients who survived more than one CPR event during the index hospitalization 34% were discharged home, compared to 43.7% of patients who survived one episode of CPR. (Table 3).

Of the 7991 patients who received CPR more than once, 7379 had 2 episodes, 528 had 3, 66 had 4, and 16 had 5 episodes. In the additional multivariable model with CPR

categorized ordinally as the number of events, we found that each additional episode of CPR was associated with a 55% decrease in the odds of survival to discharge. (Table 4)

## 2.6 Discussion

We found that 17.5% of patients who received CPR in-hospital survived to hospital discharge, which is similar to prior reports[4]. In patients who underwent more than one episode of CPR during the same hospitalization, survival to discharge was less than half of this, at 8.8%. Additionally, patients who received CPR more than once during hospitalization and survived to discharge had a median survival of only 10.5 months. These results are perhaps not surprising since patients receiving CPR more than once during a hospitalization are likely to have a higher severity of illness as well as a different distribution of the underlying proximal causes of cardiac arrest than patients who undergo one CPR event. However, in this study we were only able to assess burden of chronic illness with Deyo-Charlson score, which is a valid measure of chronic disease burden but does not accurately estimate acute severity of illness[13]. In addition to probable increased severity of illness, there are other explanations for decreased survival after a second episode of CPR than after a first episode. Cardiac arrest can lead to multi-organ failure, even when CPR successfully restores spontaneous circulation. Patients with underlying organic heart disease are more likely to have an arrest rhythm of ventricular tachycardia or ventricular fibrillation compared to people with severe underlying non-cardiac illnesses where arrest rhythms such as asystole or pulseless electrical activity are more common[14]. Outcomes of CPR with initial arrest rhythms of asystole and PEA are significantly worse than other dysrhythmias and often recur in patients with high severity

of illness and a primary non-cardiac illness that is the underlying risk factor for cardiac arrest[8, 15, 16].

Among all patients receiving CPR twice or more in a hospitalization, we found that black patients had a lower survival rate than whites and patients of other races, and this finding was confirmed in adjusted analyses. These results are similar to prior reports of CPR that did not specifically investigate multiple episodes of CPR. Prior work with CMS data has found that a greater proportion of black patients than white patients receive CPR before death[4]. These findings might be explained by the higher incidence of cardiovascular disease and increased severity of illness among black patients[17]. However, multiple studies have also found that black patients tend to choose to receive life sustaining treatments more often than white patients, despite having worse severity of illness[18]. It is interesting in our study that black patients comprise 13.6% of all patients receiving CPR once, but 16.2% of patients receiving CPR two or more times. Therefore, it is also possible that a higher proportion of black patients than white patients are choosing to remain “full code” even after having survived one episode of CPR. Alternatively, physicians tend to have fewer end-of-life discussions with black patients[19], which may also lead to a higher proportion of black patients receiving CPR twice. It is also interesting that unlike the results of most studies of survival after CPR, this study of individuals receiving in-hospital CPR more than once during a hospitalization did not find a linear association with greater age and lower odds of survival. Only in patients > 90 years of age was the association between lower odds of survival and age statistically significant. Explanations for this lack of association are unclear. Among patients receiving CPR more than once during a hospitalization, adjusted analyses also found that



undergoing CPR at a non-metropolitan hospital was associated with improved survival to hospital discharge. The most likely explanation for this finding is the variation in illness severity among patients hospitalized in metropolitan versus non-metropolitan hospitals with metropolitan hospitals having more seriously ill inpatient populations[20].

However, we cannot examine this explanation within MedPAR data because they do not contain a true measure of severity of illness. This finding could also be explained by transfer of sick survivors from one or more episode of CPR from non-metropolitan to metropolitan hospitals. Indeed, a significant proportion of patients undergoing CPR one or more times were discharged from one hospital to another hospital implying transfer for higher levels of care (Table 4).

Our finding that diagnoses of CHF and stroke during the hospitalization were associated with improved survival is somewhat surprising. An earlier meta-analysis found that patients with severe CHF (Class III/IV) and recent stroke had higher mortality after CPR[21] and a separate study consisting largely of patients with primary cardiac disease as the risk for cardiac arrest found that the likelihood of survival decreased with increasing CHF severity[22]. Reasons for differences between the results of our study and prior studies are unclear, especially with regard to stroke. Within our data, it is not possible to discern the severity of CHF, so it is possible that our CHF population predominately consists of patients with very mild disease who are more likely to have more survivable arrhythmias such as ventricular fibrillation and tachycardia or are more likely to be hospitalized in monitored beds where impending cardiopulmonary arrest might be noticed earlier. Another explanation may be that patients who undergo CPR are

being misclassified as having CHF as a result of the CPR itself.

Crude analyses found that survival to hospital discharge in patients who experience more than one CPR event (8.8%) was less than half of that in patients having one CPR event (17.7%). Multivariable analyses confirmed this finding and demonstrated that patients who had CPR previously during a hospitalization had a 60% lower odds of survival to discharge. These results are important when discussing prognosis and advanced directives with patients and their loved ones.

Median survival in patients receiving more than one CPR effort was 10.5 months compared to those receiving only one CPR event at 20.6 months. Additionally, those having more than one CPR event were significantly less likely to be discharged home, with two-thirds of these patients being discharged to skilled nursing facilities, other hospitals or hospice. This information is also important to convey to patients and families when discussing treatment preferences, as prior work has suggested that patients will often choose to forgo CPR if they understand that the sequelae of surviving CPR may likely involve institutionalization and reduced quality of life [23-25].

This study has several limitations. Our definition of CPR within CMS data is based on ICD-9 codes. Although this definition of CPR does not reflect a single method of resuscitation or its effectiveness, it has been used in prior work utilizing CMS data[4]. This definition has not been validated, and short of a large, lengthy, and expensive prospective cohort study cannot be validated. However, the fact that overall incidence of

and survival after CPR in this cohort is similar to numerous studies is reassuring that case ascertainment within CMS data is accurate[26, 27][9]. Another limitation is the absence of information known to be associated with survival within our dataset. For example, we did not have data on severity of illness or initial rhythm at the time of cardiac arrest. This information would be beneficial in understanding the poor long-term survival for patients receiving CPR more than once. Though it is not the most recently validated comorbidity index, we chose to use the Deyo-Charlson score to assess the burden of chronic coexisting illness so that the results of this study could be compared to prior studies using the Deyo-Charlson index.

Additionally, these data were obtained from Medicare patients only. Previous studies have shown that in non-Medicare patient variables such as age, diabetes and cardiac disease have significant associations with outcomes even when these are not seen in Medicare populations.[28] Further, these findings may not be generalizable to a younger population as our results pertain to adults older than 64 years. However, our results are generalizable to most older patients because 97% of Americans older than 64 years of age have Medicare.[29] These limitations need to be considered when clinicians use these data to discuss treatment options with patients. These findings should be used along with other prognostic information such as severity of illness and patient's goals of care while making shared decisions about treatment.

## 2.7 Conclusion

In summary, survival to discharge in patients who receive more than one episode of CPR during a hospitalization is only 8.8%, much lower than a 17.7% survival rate in patients

receiving CPR once. Long-term survival in the cohort of patients who survived a second CPR event is also significantly reduced with a median survival of 10.5 months.

Predictors of survival to discharge include non-metropolitan hospital location and white race. Finally, the number of patients receiving CPR more than once is substantially smaller than the number receiving a single episode of CPR. This observation is likely an indirect reflection of a complex set of factors including clinician prognostication, patient and surrogate values and preferences, and communication between these parties.

Subsequent investigation should explore these important dimensions in CPR decision-making.

This study provides important prognostic information for patients who have had one episode of CPR and survived. Clinicians are often asked to discuss end-of-life care with patients in the in-patient setting. Patients who have survived an episode of in-hospital CPR compose a unique population that should receive counseling on end-of-life care and preferences. Our findings will allow clinicians to have this information available when carrying out these discussions.

<b>Table 2.1: Survival to discharge by patient and hospital characteristics and number of CPR events during a single hospitalization</b>				
	<b>One CPR Event*</b>		<b>More than One CPR Event*</b>	
	<b>n (%)</b>	<b>% Surviving [95% CI]</b>	<b>n (%)</b>	<b>% Surviving [95% CI]</b>
<b>Total</b>	413,403	17.7 [17.5, 17.8]	7,991	8.8 [8.2,9.4]
<b>Sex</b>				
<b>Men</b>	208,740 (50.5)	16.8 [16.6, 16.9]	4,057 (50.7)	9.1 [8.2, 10.0]
<b>Women</b>	204,663 (49.5)	18.6 [18.4, 18.8]	3,934 (49.2)	8.4 [7.5, 9.2]
<b>Age</b>				
<b>65-69</b>	60,056 (14.5)	21.8 [21.4, 22.1]	1,368 (17.1)	8.9 [7.4, 10.5]
<b>70-74</b>	80,241 (19.4)	20.3 [20.0, 20.6]	1,667 (20.8)	9.3 [7.9, 10.7]
<b>75-79</b>	93,582 (22.6)	18.4 [18.2, 18.7]	1,852 (23.2)	9.0 [7.7, 10.3]
<b>80-84</b>	87,365 (21.1)	16.3 [16.0, 16.5]	1,664 (20.8)	7.1 [7.9, 10.7]
<b>85-89</b>	59,700 (14.4)	14.3 [14.0, 14.6]	969 (12.1)	7.8 [6.1, 9.5]
<b>≥90</b>	32,459 (7.9)	11.3 [11.0, 11.7]	471 (5.9)	5.3 [3.2, 7.3]
<b>Race</b>				
<b>White</b>	337,020 (81.2)	18.5 [18.4, 18.6]	6,263 (78.4)	9.7[9.0, 10.5]
<b>Black</b>	56,077 (13.6)	13.6 [13.3, 13.9]	1,293 (16.2)	5.0 [2.8, 6.2]
<b>All Other</b>	20,306 (4.9)	15.6 [15.1, 16.1]	435 (5.4)	5.5 [3.3, 7.6]
<b>Races</b>				
<b>Deyo-Charlson score</b>				
<b>0</b>	73,659 (17.8)	18.0 [17.7, 18.2]	1,263 (15.8)	7.8 [6.3, 9.3]
<b>1</b>	138,600 (33.5)	18.5 [18.2, 18.7]	2,679 (33.5)	8.8 [7.7, 9.9]
<b>2</b>	111,047 (26.9)	18.4 [18.1, 18.6]	2,237 (27.9)	9.9 [8.6, 11.1]
<b>≥3</b>	90,097 (21.8)	15.3 [15.1, 15.6]	1,812 (22.7)	7.9 [6.7, 9.2]
<b>SNF Residence</b>				
<b>Yes</b>	10,411 (2.5)	11.0 [10.4, 11.6]	183 (2.3)	4.9 [1.7, 8.0]
<b>No</b>	402,992 (97.5)	17.9 [17.7, 18.0]	7,808 (97.7)	8.8 [8.2, 9.5]
<b>Zip code Median Income</b>				
<b>&lt; \$15,000</b>	8,644 (2.0)	7.1 [6.5, 7.6]	69 (0.9)	5.8 [.14, 11.4]
<b>\$15,000-29,999</b>	80,955 (19.6)	16.2 [15.9, 16.4]	1,649 (20.6)	7.2 [5.9, 8.4]

<b>\$30,000-44,999</b>	185,745 (44.9)	18.5 [18.3, 18.7]	3,635 (45.5)	9.9 [8.9, 10.9]
<b>\$45,000-59999</b>	78,507 (18.9)	18.4 [18.1, 18.6]	1,511 (18.9)	9.0 [7.5, 10.4]
<b>\$60,000-74,999</b>	31,433 (7.6)	18.2 [17.7, 18.6]	594 (7.4)	7.4 [5.3, 9.5]
<b>\$75,000+</b>	15,894 (3.8)	18.3 [17.7, 18.9]	277 (3.4)	6.8 [3.8, 9.8]
<b>No income data</b>	12,225 (2.9)	16.6 [16.0, 17.3]	260 (3.25)	6.9 [3.8, 10.0]
<b>Diagnoses</b>				
<b>Myocardial Infarction</b>				
<b>Yes</b>	88,441 (21.4)	19.9 [19.6, 20.2]	2,124 (26.6)	9.2 [7.9, 10.4]
<b>No</b>	324,962 (78.6)	17.1 [16.9, 17.2]	5,867 (73.4)	8.6 [7.9, 9.3]
<b>Congestive Heart Failure</b>				
<b>Yes</b>	160,522 (38.8)	19.9 [19.7, 20.1]	3,616 (45.2)	10.7 [9.7, 11.7]
<b>No</b>	252,881 (61.2)	16.3 [16.1, 16.4]	4,375 (54.8)	7.1 [6.4, 7.9]
<b>Stroke</b>				
<b>Yes</b>	36,275 (8.8)	17.4 [16.9, 17.7]	593 (7.4)	11.4 [8.9, 14.0]
<b>No</b>	377,128 (91.2)	17.7 [17.6, 17.8]	7,398 (92.6)	8.5 [7.9, 9.2]
<b>Diabetes Mellitus</b>				
<b>Yes</b>	75,034 (18.1)	16.6 [16.3, 16.9]	1,484 (18.5)	7.4 [6.1, 8.7]
<b>No</b>	338,369 (81.8)	17.9 [17.8, 18.1]	6,507 (81.4)	9.1 [8.4, 9.8]
<b>COPD</b>				
<b>Yes</b>	111,776 (27.0)	18.3 [18.1, 18.5]	2,190 (27.4)	8.8 [7.6, 10.0]
<b>No</b>	301,627 (72.9)	17.5 [17.3, 17.6]	5,801 (72.6)	8.7 [8.0, 9.5]
<b>Hospital Characteristics</b>				
<b>Rurality</b>				
<b>Metropolitan</b>	329,683 (79.7)	17.4 [17.3, 17.5]	6,647 (83.2)	8.4 [7.7, 9.0]
<b>Non-Metro</b>	69,770 (16.9)	20.5 [20.2, 20.7]	1,201 (15.0)	11.2 [9.4, 13.0]
<b>Unknown</b>	13,950 (3.3)	10.2 [9.7, 10.7]	143 (1.8)	5.6 [1.8, 9.4]
<b>Teaching Status</b>				

<b>Teaching Hosp.</b>	138,051 (33.4)	16.9 [16.7, 17.1]	2,351 (29.4)	8.6 [7.5, 9.7]
<b>Non-Teaching</b>	274,606 (66.4)	18.1 [17.9, 18.2]	5,637 (70.5)	8.8 [8.1, 9.6]
<b>Hospital Size</b>				
<b>&lt;250 beds</b>	157,088 (38.0)	18.7 [18.5, 18.9]	2,925(36.76)	10.1 [8.9, 11.1]
<b>250-449 beds</b>	135,860 (32.8)	17.3 [17.1, 17.5]	2,951 (36.9)	8.4 [7.4, 9.4]
<b>450 + beds</b>	119,709 (28.9)	16.8 [16.6, 17.0]	2,112 (26.4)	7.6 [6.5, 8.7]
<b>*<math>\chi^2</math> p&lt;0.001 for all between-category differences both groups (one CPR event and more than one CPR event)</b>				

**Table 2.2. Multivariable analyses of factors associated with survival to discharge in patients with more than one CPR event during a single hospitalization**

Predictor	Adjusted Odds Ratio of Survival [95%CI]	P value
<b>Age (years)</b>		
65-69	(reference)	--
70-74	1.01 [0.79, 1.3]	0.93
75-79	0.94 [0.74, 1.2]	0.62
80-84	0.96 [0.76, 1.22]	0.77
85-89	0.76 [0.56, 1.03]	0.084
≥ 90	0.53 [0.34, 0.82]	0.005
<b>Male sex</b>	1.04 [0.89, 1.22]	0.61
<b>Race</b>		
White	(reference)	--
Black	0.51 [0.39, 0.66]	<0.001
Other	0.57 [0.35, 0.90]	0.017
<b>Deyo-Charlson Score</b>		
0	(reference)	--
1	0.77 [0.58, 1.01]	0.063
2	0.68 [0.49, 0.96]	0.03
≥3	0.51 [0.34, 0.76]	0.001
<b>Admission from SNF Residence</b>	0.61 [0.31, 1.22]	0.16
<b>Discharge Diagnosis</b>		
Myocardial Infarction	1.14 [0.93, 1.40]	0.20
Congestive Heart Failure	1.85 [1.52, 2.27]	<0.001
Stroke	1.78 [1.34, 2.36]	<0.001
Diabetes Mellitus	0.93 [0.73, 1.20]	0.59
COPD	1.10 [0.91, 1.35]	0.32
<b>Hospital Characteristics</b>		
<b>Non-metropolitan</b>	1.25 [0.99, 1.55]	0.052
<b>Teaching</b>	1.15 [0.94, 1.55]	0.17
<b>Hospital size</b>		
<250 beds	(reference)	--
250-449 beds	0.84 [0.69, 1.03]	0.09
450 + beds	0.74 [0.58, 0.95]	0.02



<b>Table 2.3. Discharge destination for survivors of CPR events during the index hospitalization</b>		
<b>Discharge Destination</b>	<b>One CPR event (n=73,218)</b>	<b>More than one CPR event (n=702)</b>
<b>Skilled nursing facility</b>	22.8%	21.8%
<b>Other hospital</b>	31.6%	42.6%
<b>Hospice</b>	1.8%	1.6%
<b>Home</b>	43.7%	34%

$\chi^2$  p<0.001 for all comparisons between one CPR event and More than one CPR event.

**Table 2.4. Multivariable analyses of number of CPR events and other factors associated with survival to discharge**

Predictor	Adjusted Odds Ratio of Survival [95%CI]	P value
<b>Number of CPR events</b>	0.45 [0.42, 0.49]	<0.001
<b>Age (years)</b>		
65-69	(reference)	--
70-74	0.90 [0.87, 0.92]	<0.001
75-79	0.77 [0.75, 0.79]	<0.001
80-84	0.65 [0.63, 0.66]	<0.001
85-89	0.54 [0.52, 0.56]	<0.001
≥ 90	0.41 [0.39, 0.43]	<0.001
<b>Male sex</b>	0.84 [0.83, 0.85]	<0.001
<b>Race</b>		
White	(reference)	--
Black	0.71 [0.69, 0.74]	<0.001
Other	0.93 [0.89, 0.97]	0.001
<b>Deyo-Charlson Score</b>		
0	(reference)	--
1	0.75 [0.73, 0.77]	<0.001
2	0.58 [0.56, 0.60]	<0.001
≥3	0.43 [0.41, 0.45]	<0.001
<b>Admission from SNF Residence</b>	0.63 [0.57, 0.69]	<0.001
<b>Discharge Diagnosis (referent group patients without any of these diseases)</b>		
Myocardial Infarction	1.39 [1.35, 1.42]	<0.001
Congestive Heart Failure	1.63 [1.59, 1.66]	<0.001
Stroke	1.30 [1.26, 1.35]	<0.001
Diabetes Mellitus	1.10 [1.07, 1.12]	<0.001
COPD	1.24 [1.21, 1.27]	<0.001
<b>Hospital Characteristics</b>		
<b>Non-metropolitan</b>	1.13 [1.08, 1.18]	<0.001
<b>Teaching</b>	1.01 [0.96, 1.06]	0.768
<b>Hospital size</b>		
<250 beds	(reference)	--
250-449 beds	0.92 [0.88, 0.96]	<0.001
450 + beds	0.89 [0.84, 0.94]	<0.001

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## **Chapter 3: Telemedicine as a Tool to Provide Family Conferences and Palliative Care Conferences in Critically Ill Patients in Rural Health Care Institutions- A Pilot Study**

### **3.1 Abstract**

Many critically ill patients who transfer from rural hospitals to tertiary care centers (TCCs) have poor prognoses and family members are unable to discuss the patient prognosis and goals of care with TCC providers until after transfer. Aim: Our TCC conducted teleconferences prior to transfer to facilitate early family discussions. Design/Setting: We conducted a retrospective review of these telemedicine family conferences among critically ill patients requested for transfer that occurred from December 2008 to December 2009 at our TCC. Outcomes for each patient and detailed descriptions of the conference content were obtained. We also assessed limitations and attitudes and satisfaction with this intervention among clinicians. Results: During the 12 month period, 12 telemedicine consultations were performed. Ten of these patients (83%) died in the 30 days following the request for transfer. After the telemedicine consultation, 8 patients (67%) were transferred to our TCC from their respective hospitals, while 4 patients (33%) continued care at their regional hospital and did not transfer. Of the patients who transferred to TCC, seven (88% of those transferred) returned to their community after a stay at the TCC. Conclusions: This study demonstrates that palliative care consultations can be provided via telemedicine for critically ill patients and that adequate preparation and technical expertise are essential. Although this study is limited by the nature of the retrospective review, it is evident that more research is needed to further assess its applicability, utility and acceptability.

### 3.2 Background

Critically ill patients have a high risk of death and are often first seen at smaller rural hospitals and subsequently transferred to tertiary care intensive care units (ICUs) for a higher level of care[1]. These transferred critically ill patients are at very high risk of adverse events due to the inter-hospital transport and the nature of their illness[2]. Early and open communication about prognosis, palliative care and end-of-life (EOL) issues is very important to such critically ill patients and their families[3, 4]. Studies have shown that early prognostic communication increases perceived quality of death and dying among family members of loved ones who die in the ICU. [3] There is a high rate of post-traumatic stress disorder (PTSD) in family members of critically ill patients[5-9] and this rate has been reduced with early, effective communication[3]. Due to the long transfer times and the need for family members to travel to the receiving hospital, families of these patients may not be able to participate in discussions regarding disease processes, prognosis and goals of care until after the patient has been transferred, sometimes even days into their loved one's critical illness. This lack of early communication with clinicians created by the transfer process may add additional burden to family members who are already experiencing stress and anxiety due to their loved one's illness. In addition, pre-transfer evaluation of the medical condition, treatment options, prognosis and discussion of goals of care could help with early identification of situations where treatment plans delineate comfort-directed EOL care. In such situations the added burdens of transfer and increasing distance between patients and family at EOL

may outweigh benefits of transfer if EOL care could be successfully delivered in their home community.

Our hospital is the only tertiary care center (TCC) for a large catchment area that comprises all of Vermont and most of upstate New York. Our MICU has approximately 900 admissions per year and about one-third of these are direct transfers from rural hospitals in the region. At our institution, Fletcher Allen Health Care (FAHC) in Burlington, VT, we have been using telemedicine to provide a variety of subspecialty consultations to rural institutions throughout Vermont and much of upstate New York. Our clinicians have used telemedicine as a tool to provide family members and treatment teams the opportunity for early family conferences and palliative care consultations prior to transfer of critically ill patients. Telemedicine has been increasingly used for educational and clinical purposes to overcome distances between participants, especially in rural communities, but to our knowledge we are the first center to use it for early clinician-family communication in critically ill patients prior to transfer to a tertiary center ICU.

We hypothesize that telemedicine family conferences may ultimately lead to decreased burden on family members and provision of care in alignment with patient wishes. In order to fully explore this hypothesis a prospective qualitative and comparative study is needed. This study describes a retrospective review of telemedicine palliative care conferences at our hospital as an initial step to assess feasibility of using this tool for patients who are critically ill transferring from smaller community hospitals to our TCC.

### 3.3 Methods

The purpose of this retrospective review was to investigate the feasibility and describe patient outcomes of palliative care consultations via telemedicine in critically ill patients. We also sought to identify any immediate barriers to conducting such conferences. Telemedicine has been used as a method of communicating and conducting palliative care consultations at our institution since late 2008 as a result of a communication quality improvement initiative. To gather information on using telemedicine in a palliative care setting, we retrospectively examined telemedicine palliative care conferences that occurred from December 2008 to December 2009 at FAHC. For this study, we focused on palliative care consultations that occurred via telemedicine for critically ill patients with a high risk of death who were being prepared for transfer to our Medical Intensive Care Unit (MICU).

#### Patient Population:

In this review, we included patients who had been requested for transfer to our MICU from several rural community hospitals. Additionally, we included patients with one or more of the following diagnoses that may have served as a trigger for the accepting physician to offer a teleconference prior to transfer: prolonged multi-system organ failure; metastatic cancer with respiratory or cardiac failure; severe anoxic encephalopathy; very advanced age (>90 years) with organ failure; advanced dementia; or end-stage heart, liver or lung disease with less than six months estimated survival or with a poor baseline quality of life.



### Intervention:

All TCC accepting physicians had received in-service training about palliative care teleconferences when the local quality improvement initiative began. Referrals were typically generated when accepting physicians from the TCC ICU determined that patients being requested for transfer were at high risk of death and had at least one of the above mentioned inclusion diagnoses. Accepting physicians then asked the referring physicians to consider a telemedicine family conference. If the transferring physician and the family members/loved ones of the critically ill patient agreed, a telemedicine palliative care family conference would occur. Conferences usually included the transferring physician and family member/loved ones of the patient to be transferred conferenced in with several team members at our TCC including the MICU attending physician accepting the transfer, a social worker, a member of the palliative care team, and trainees in Internal Medicine or Pulmonary and Critical Care Medicine.

The goals of the teleconference were to assess family/surrogate understanding of illness and expectations, discuss treatments and prognosis, and ascertain goals of care including discussion of end of life care goals if the illness was felt not to be survivable. If transfer was consistent with the patient's goals, the aim was to facilitate smooth transition of care, in both medical and social domains. If goals of care were focused on comfort-directed end of life care, our providers supported appropriate care planning at the patient's home institution.

### Technology:

Our site's tele-palliative care consultations are performed with state-of-the-art videoconference equipment including both stationary and roving units, which can be

moved to any part of the hospital. Videoconference apparatuses at rural transferring hospitals are either stationary units located in the emergency room (ER) or roving units that are moved to the local ICUs for teleconferencing. Analysis:

To gain a better understanding of this novel intervention, we performed a retrospective descriptive analysis assessing the number of consultations provided during the study period, whether the patients in question transferred to FAHC or remained at their home institution, patient demographics, and mortality and disposition of patients after hospitalization. Potential barriers were assessed by review of conference notes made by participating clinicians. Data sources included the electronic health record as well as informal documentation by the physician running the conferences, which were maintained outside of the health record for the purpose of tracking data during the quality improvement initiative. We obtained Institutional Review Board (IRB) approval prior to reviewing these data.

### **3.4 Results**

During the 12-month study period, 12 tele-palliative care consultations were performed for critically ill patients who had been requested for transfer to FAHC. The age of the patients ranged from 46-84 years of age with a mean age of  $65.6 \pm 10.6$  years. Detailed descriptions of these 12 cases are shown in Table 1. Of the 12 patients who received a tele-palliative care consultation, eight (67%) transferred from the referring hospital to our institution, while four (33%) remained at their home institution. After transfer to FAHC, seven of the eight transferred patients (88%) ultimately transferred back to their local hospital for ongoing care; 10 of the 12 patients (83%) died within 30 days of the

conference. Two conferences were delayed due to inability of the TCC physician to participate at a specific time. All patients who transferred from the referring institution were admitted to the TCC ICU; none were stable enough for admission to the medical ward.

On review of notes taken by conference participants at FAHC, the most common documented barriers to conducting a telemedicine conference were technical limitations including problems with starting the telemedicine units and connecting between both institutions. Another perceived limitation by clinicians at our TCC was the belief that it would generally not be feasible to conduct telemedicine conferences during “off” hours in the evenings and on weekends, when dedicated telemedicine technicians were unavailable to assist with setup and to troubleshoot, unless they were appropriately trained on using the equipment and its use was relatively easy and expeditious. They were also concerned about the perceived loss of “value of in-person physician-patient relationships” and the possible change in the perception of the local physician’s role. Many TCC clinicians also expressed concern over time involved in conducting these conferences.

### **3.5 Discussion**

This small retrospective study of telemedicine as a method of conducting MICU/palliative care consultations for critically ill patients with a high risk of death revealed that it is feasible to conduct tele-palliative care consultations in this patient cohort. Studies have shown that early communication about prognosis and goals of care can lead to increased rates of formalization of advance directives and utilization of

hospice services as well as lower use of non-beneficial life-prolonging treatments for critically ill patients who are at the end of life[10]. Proactive palliative care consultations are associated with a significantly shorter ICU length of stay without any significant differences in mortality rates or discharge disposition[10-14]. For these reasons, if telemedicine can be proved to be a useful method of early communication, it may be a valuable tool to improve these parameters among rural patients.

Among the 12 patients receiving a tele-palliative care conference in our study, 83% died within 30 days of the conference, suggesting that the patients selected by their clinicians for these conferences are those at very high risk of death based on their admission diagnosis and other factors[15]. Despite receiving an early palliative care consultation, the majority of these patients still transferred to our facility for further care. However, it is notable that 7/8 (88%) of those patients who transferred to FAHC eventually transferred back to their initial transferring hospital or another care facility closer to home for ongoing medical care and/or EOL care. Because this study was a retrospective chart review, the reasons for transfer back to the referring hospital are not clear, as these details were not always available in the medical record. Possible reasons include: 1) patients/families received the care they expected at FAHC and no further tertiary level care was needed, 2) patients/families preferred to receive the remainder of their care closer to home, and 3) after a period of evaluation and treatment, the MICU team at FAHC concluded that further intensive or tertiary care interventions would no longer provide benefit. . Further evaluation is warranted to determine if early discussion of prognosis and goals of care as outlined in this project have a direct impact on the decision and timing of transition of goals and location of care preferences. A study conducted by

Yun et al found that patients who were aware of their terminal status were more likely to use palliative care (70.6%) services and less likely to use the ICU (50.0%).[16] Previous studies have also reported that patients who are dying usually prefer to die at or near home[17, 18], and the patients/families in our study who transferred to FAHC may have realized, through their care and communication at our institution and prior to transfer, that death was imminent and thus chose to spend their final days at or closer to home. Thirty-three per cent of patients in this study did not transfer after receiving a tele-palliative care consultation, possibly due to the patient's family feeling reassured that care that would be provided at our TCC beyond what was received at the transferring hospital would be unlikely to provide benefit and that death was imminent. In addition to the potential impact on healthcare cost, another important potential benefit of the telemedicine intervention may be that it decreases the psychosocial burden on patients and families in cases where transfer of patients expected to die within a short time is avoided. However, a prospective study with participant interviews would be necessary to reliably determine the reasons for not transferring and impact of that decision on care and satisfaction.

Technological issues were the most commonly cited barriers to conducting these conferences. Although using formal telemedicine equipment is useful in that the units allow for greater clarity and visualization, we may be able to overcome this limitation by using simpler and widely available web conferencing services. However, palliative care consultations typically involve quite sensitive discussions, and using web-based services may be currently limited due to privacy concerns.

There are several limitations to this study. First, because it was retrospective, we are not able to assess the quality of the telemedicine conference and we do not have any qualitative/experiential data from conference participants. For example, we do not have data on the types of questions that the family members asked or the responses from physicians. Additionally, there are no data regarding the number of participants on each side of the telemedicine conference. Therefore although we can infer that conducting these conferences is feasible, the perceptions of participants and utility of such an intervention cannot be evaluated. Another limitation of this study is that we did not have access to data from the transferring hospitals so we are not able to gain a better understanding of why patients transferred back to their local hospital. In addition, we do not have any experiential data from the four patients who chose not to transfer to our site after the telemedicine conference. From a quantitative standpoint, we do not know how long it took from initial referral to initiation of the conferences or how many requests for telemedicine conferences were made during the study period but did not occur. Furthermore, the sample in this study is small so generalizations and inferences need to be made cautiously. Despite these limitations, this pilot study does show some important preliminary findings using a novel intervention. Providing earlier communication and addressing palliative domains prior to MICU transfer via teleconferencing is feasible and doing so offers an opportunity to assess if transfer is consistent with goals, prognosis and patient/family preference.

#### Future Directions:

In view of these data and taking into consideration the limitations of this pilot study, we are now conducting a prospective qualitative study of telemedicine family conferences in

critically ill patients in rural hospitals with a high risk of death prior to transfer to a TCC ICU. We will be assessing further feasibility questions such as timing of conferences, technological limitations, and overall acceptability of this form of communication by all participants. We will also assess perceptions of family members/loved ones and clinician participants in the conferences as well as gauging family satisfaction and quality of communication during the teleconferences.

### **3.6 Conclusion**

This study demonstrates that palliative care consultations can be provided via telemedicine for critically ill patients and that adequate preparation and technical expertise are essential. In this study, most patients who received this type of telemedicine conference still transferred to our TCC but ultimately transferred back to their community for the remainder of their care (community hospital, skilled nursing facility or home). This is important information because telemedicine in this setting is a novel approach to communication and may improve rural communities' access to palliative care and MICU consultations. These critical care/palliative care telemedicine conferences may also reduce costs of care through early identification and limitation of non-beneficial intensive therapies and optimization of community based end-of-life resources. Palliative care/critical care telemedicine is a new approach to delivering high quality patient care by providing excellent communication and by better aligning care with patient and family wishes. More research is needed to further assess its applicability and utility.

Table 3.1: Patient and Conference Descriptions						
Case	Age (yrs)	Sex	Diagnosis	Description	Transfer Status	Death within 30 days
1	46	M	Brain Injury	Admitted with large cerebrovascular accident (CVA) and fall, hospitalized at a community hospital for 15 days. After minimal improvement and inability to wean from mechanical ventilation a request to transfer to TCC for further management was made. The teleconference established that family hoped for restorative goals with an ultimate goal to return home. Patient transferred and remained at TCC for 20 days before transferring to a long term acute care facility near home	Transferred	No
2	70	F	Multi-system organ failure (MSOF)	Admitted with sepsis from a urinary source with bacteremia and subsequent multi-system organ dysfunction. Request to transfer for further management of sepsis. The teleconference with 2 sons and daughter present discussed patient had felt his quality of life was excellent prior to acute illness. Established restorative goals. Transferred to	Transferred	Yes



				TCC and remained for 10 days. Transferred back to referral hospital for end-of-life care.		
3	76	F	MEOF/ End Stage Renal Disease (ESRD)	Admitted with sepsis of unclear etiology with multi-system organ dysfunction. Request to transfer to TCC for end stage renal disease and need for acute dialysis. The teleconference details were not documented. Patient remained at TCC for 12 days. Family decided to discontinue or withhold life-prolonging treatments (i.e. dialysis, no tracheostomy, no mechanical ventilation). Transferred back to local hospital for hospice services.	Transferred	Yes
4	74	M	Colectomy/Post-operative complications	Admitted with intestinal obstruction, underwent exploratory laparotomy with subsequent post-operative complications and failure to liberate from the ventilator. Request to transfer to TCC due to inability to wean pt. from ventilator. During the teleconference family described that the patient perceived his baseline quality of life to be poor. Family desired transfer to TCC for a second opinion from surgery and medical consultants for hopes of achieving	Transferred	Yes

				restorative goals. Patient was transferred to TCC for one week and then transferred back to referral hospital once efforts proved to be ineffective. Patient died 1 week later after withdrawal of life-sustaining measures.		
5	64	M	Cirrhosis/ Acute Renal Failure	Admitted with liver failure and progressive hepatorenal syndrome. Request to transfer to TCC for dialysis. The family teleconference revealed history of alcoholism and Hepatitis C infection. Very poor quality of life prior to admission. Wife wanted trial of dialysis. Patient transferred to TCC, underwent dialysis for 2 days. The patient had a rapid clinical decline in clinical status requiring increasing life support measures. Due to failure to improve, family decided to transition to treatment therapies directed at primarily at comfort. After withdrawal of life-sustaining measures, the patient was transferred home with hospice.	Transferred	Yes
6	67	F	Meningitis/ Cerebrovascular Accident (CVA)	Admitted with bacterial meningitis to a local hospital. Course complicated by multiple large areas of stroke and progressive decline in	No	Yes

				clinical status despite therapies. Request to transfer to TCC for further management. During the family teleconference the patient's children and spouse discussed with palliative care the patient's poor prognosis and decision to withdraw life-sustaining measures at transferring hospital was made.		
7	55	M	Advanced Amyotrophic Lateral Sclerosis (ALS)	Admitted with progressive ALS and respiratory failure. Intubated and request to transfer to TCC to assist with management. The family teleconference established goals to return home if possible. Agreed to palliative care support throughout hospitalization. The patient was transferred to TCC for 14 days then transferred back to local hospital with a long-term ventilator. Acute decline at patient's local hospital and died within a week of transfer.	Transferred	Yes
8	84	F	MSOF/ ESRD	Admitted with sepsis and ESRD. Transfer requested for management of renal failure. Family teleconference: established patient was a nursing home resident prior to admission due to multiple chronic medical	Transferred	Yes

				problems. Family goals were to return to previous functional status. The patient was transferred to our TCC and had acute decline in the first 24 hours. Family changed status to Do-Not-Resuscitate (DNR) and patient expired in the TCC Intensive Care Unit.		
9	57	M	CVA/ Pneumonia	Admitted with cerebrovascular accident at local hospital and subsequently developed acute pneumonia and respiratory failure. Transfer was requested for further subspecialty experience. The family teleconference confirmed that family wanted short-term intubation and trial of all therapies. The patient transferred to the TCC and was extubated on TCC hospital day #4, status changed to DNR/DNI transferred to floor and subsequently back to referral hospital for further management. The patient died at the local hospital several days later (reason not documented in TCC records).	Transferred	Yes
10	64	F	Chronic Obstructive Lung Disease (COPD)	Admitted with COPD exacerbation and respiratory failure. Transfer was requested for further management with subspecialty	No	No

				experience. The family teleconference established that the patient had severe oxygen dependent COPD and although they had restorative goals they did not want the patient transferred if no additional therapies were available. The patient was ultimately extubated at the referral hospital and survived to discharge. Died at transferring hospital 7 months later after another COPD exacerbation.		
11	58	M	Metastatic Esophageal and Lung Cancer	Admitted with respiratory failure. Request for transfer for further management. The family teleconference revealed history of metastatic esophageal and lung cancer. Goals were restorative and after discussion with family, palliative care and oncology specialists it was determined that further therapies did not align with this goal. Decision to transfer the patient to hospice services.	No	Yes
12	73	M	COPD/ Congestive Heart Failure (CHF)	Admitted for COPD/CHF exacerbation and respiratory failure. Request for transfer to TCC was made for	No	Yes

				management of respiratory failure. Family teleconference established that the patient was in a nursing home prior to admission and had a poor quality of life. After discussion with palliative care, the family decided to continue with therapy with no escalation of care at their local hospital, changed status to DNR/DNI. Remained at the local hospital for care and died 3 days later.		
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Table Key: CVA: cerebrovascular accident, TCC: tertiary care center, MSOF: multi-system organ failure, ESRD: end stage renal disease, DNR: Do-Not-Resuscitate, DNI: Do-Not Intubate, COPD: chronic obstructive pulmonary disease, CHF: congestive heart failure.

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## **Chapter 4: Clinicians' Perceptions of Telemedicine for Conducting Family Conferences Prior to Transfer to a Tertiary Care Center Intensive Care Unit**

### **4.1 Abstract**

Objectives: Critically ill patients are often transferred from rural to tertiary care medical centers for further higher levels of care. The transportation process may delay family conferences during which prognosis and goals of care are discussed. These conferences typically occur when family members meet the treating physicians for the first time in person after transport. Telemedicine is a tool that may be used to bridge this gap in communication by enabling these family conferences *before* transport. There are no data on perceptions of telemedicine used in this setting. We conducted a qualitative study assessing provider perceptions regarding the use of telemedicine for conducting family conferences prior to transport. Materials/ Methods:

Critical care physicians and nurses were invited to view an educational video demonstrating the process of conducting a family conference via telemedicine. Immediately following viewing of the video, physicians and nurses filled out an open-ended questionnaire regarding their thoughts and perceptions of the video and the telemedicine family conference approach. Results:

There was a 68% response rate to the surveys. Responses were categorized into two major themes: benefits and barriers. Within the theme of benefits, three sub-themes were identified: satisfaction, knowledge and quality of care. We identified four domains within the theme of barriers: time, perception, technology and logistics. Conclusions:

Respondents believe that there may be several benefits including increased satisfaction, improved communication and empowerment of families by dissemination of knowledge. Barriers to the use of this intervention identified include costs, time, technology and negative perceptions of the telemedicine conference.

## 4.2 Background

Critically ill patients have a high risk of death and are often first seen at smaller rural hospitals and subsequently transferred to tertiary care center (TCC) intensive care units (ICUs) for a higher level of care. Early and open communication about prognosis, palliative care and end-of-life (EOL) issues is very important for these critically ill patients and their families.[1, 2] Studies have shown that early communication defining prognoses increases perceived quality of death and dying among family members of loved ones who die in the ICU.[3] Due to long transfer times and the need for family members to travel to receiving hospitals, families of these patients may not be able to participate in discussions regarding disease processes, prognosis and goals of care until after the patient has been transferred, sometimes several days into their loved one's critical illness. Telemedicine may provide a solution to providing early family conferences for this patient population, and our previous research suggests that using telemedicine in this setting is feasible[4]. However, the experience and perceptions of clinicians using this novel intervention are unknown.

Telemedicine has been in existence for over 55 years and has been used in a variety of health care delivery contexts. [5, 6] Although the number of telemedicine programs has steadily increased, the consistent availability of telemedicine is still not widespread.[7-9]

This limited proliferation of telemedicine has been attributed to unavailability of technology, concerns about liability, and reimbursement issues.[5, 10-13] While telemedicine may bridge communication gaps among clinicians and family members of critically ill patients, acceptability of telemedicine technology by medical professionals has been a limitation to its diffusion on a national scale. Studies have shown that physicians represent one of the principal groups of telemedicine users, and their acceptance is critical in sustaining a telemedicine service. [12] Data suggest that there are specific factors that influence the implementation of new technology in the health care service such as perceived usefulness and usage intentions in terms of social influence (subjective norms, voluntariness, image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, perceived ease of use). These factors have been evaluated further using the Technology Acceptance Model (TAM), an information systems theory that models how users come to accept and use a technology. [14, 15] This model incorporates perceived usefulness, perceived ease of use, attitude toward use, behavioral intention to use, and other external variables to evaluate actual system use. Although various models exist to evaluate acceptance of Information Systems, the TAM model has been used extensively in evaluating acceptance of technology in the health care field. One study applying the TAM model specifically towards telemedicine found that perceived usefulness was the most significant factor affecting acceptance.[16] Attitude towards telemedicine was also considered an important factor, but has not been fleshed out in its entirety. Interestingly, perceived ease of use was considered significantly less important.

Telemedicine is a tool that may be used to bridge the gap in communication between physicians and family members of critically ill patients transferring to a tertiary ICU by enabling these family conferences *before* transport, however before successfully implementing a telemedicine intervention, perceived barriers and facilitators need to be understood and addressed to help ensure the intervention is widely accepted. There are no data on perceptions of telemedicine used in this setting. We conducted a qualitative study assessing provider perceptions regarding the use of telemedicine for conducting family conferences prior to transfer from a community hospital to a tertiary care center (TCC).

### 4.3 Methods

The study sample included providers who would potentially participate in such conferences on the accepting side of the transfer (Intensive Care, Cardiology, Palliative Care and Hospitalist physicians and nurses). These groups of providers were invited to attend a presentation about telemedicine for family conferences on four different dates. Those who attended viewed an educational video demonstrating the process of conducting a family conference via telemedicine. The video included a brief introduction to telemedicine, a sample case in which a telemedicine conference might be beneficial, a demonstration of a telemedicine family conference, and a brief summary. The video can be accessed at: <http://www.youtube.com/watch?v=gzIDU11TChE> Immediately after they viewed the video, participants filled out an open-ended questionnaire regarding their thoughts and perceptions of the video and the telemedicine family conference concept. The questionnaire was developed based on previous

literature about perceived barriers and facilitators towards telemedicine. We used questions that would generate rich qualitative data about specific concepts derived from the TAM model such as perceived usefulness, perceived ease of use, attitude towards the intervention, and likelihood to use the intervention. In addition to these quantitative data we collected information about current user trends.

#### **4.4 Analysis**

Using a general framework guided by the concepts previously described in the TAM literature, we developed a basic core set of concepts or general themes that we applied to the responses. These included perceived benefits and barriers. The results of the questionnaires were subjected to qualitative analysis (theory based approach to grounded theory) and are reported here using the results of thematic analysis[17]. Themes and subthemes are described with representative excerpts from the data to elucidate each domain identified. The responses to the questionnaires were transcribed into one working document. Two independent coders analyzed the data to identify initial axial codes. Both coders then compared codes and using a 90% inter-user agreement rate to prepare a formal codebook. Finally, both coders independently re-analyzed the data and identified themes and sub-themes, the results of which are described in Table 1. Descriptive statistics are used to describe the study population.

## 4.5 Results

Fifty surveys were distributed to nurses and physicians and 34 survey responses were received (68% response rate). Of the respondents, 20% were critical care RNs and 80% were physicians (hospitalists or ICU physicians). Sixty percent of respondents were aware of a telemedicine service available at this institution but only 9% had used it before. Thematic analysis specific to the core concepts of benefits and barriers revealed several subthemes within each category.

### Benefits:

Within the data coded under the major theme of benefits, we identified three subthemes or domains including satisfaction, knowledge and communication.

#### 1. Satisfaction:

Participants believed that there would be increased family satisfaction with care using telemedicine. Respondents believed that using telemedicine for this form of communication could decrease anxiety among family members, build relationships and allow families to outline goals of care; all of which would lead to increased satisfaction among family members.

Some examples from the questionnaires included:

“...family satisfaction and confidence of care; now there will be an understanding of goals prior to transfer, rather than the next morning.”

“Early contact with the family will improve family satisfaction. Decrease burden.”

“I can't really see a lot of downsides to this. If I were a family member, I think I would be thrilled to see the primary team prior to transfer. Families can be held out of the patient room for hours on arrival if patients are quite sick and need lines and tubes and testing. I think this period of waiting would be much easier if a conversation has already been had.”

Participants felt that the potential for improved satisfaction could apply to providers. By using telemedicine to clarify goals, providers on the accepting side would have established a relationship with family members before their arrival and providers on the transferring side would have the opportunity to communicate more directly with the accepting treatment team.

“...introduces appropriate care team prior to patient arrival and will provide a smooth transition.”

“...could greatly improve relationship building with families, save resources by avoiding unnecessary or unwanted treatments and/or transfers, and better communication between and among care providers.”

## 2. Knowledge:

Another subtheme that derived from the data was the concept of imparting knowledge.

Participants believed that by utilizing telemedicine they could teach families prior to transfer, thus allowing family members/loved ones to better understand what might occur following transfer. They felt that understanding prognosis and meeting the new treatment team prior to transfer provided families with new knowledge that would improve their overall experience with dealing with a critically ill loved one and transfer to a TCC.

“Families will already know the faces of the accepting team. Families will have a more realistic set of expectations ahead of time. (Both should improve satisfaction).”

“To know the family and their expectations and goals of care and to make sure the family is aware of the prognosis....is a real benefit”.

“Access to more background information on patients will be helpful. We can establish a better understanding for families about the current situation and what the best plan is....”

### 3. Quality of care:

Finally, several comments were related to the potential to improve quality of care.

Participants felt telemedicine would aid in improving care by allowing discussions about prognosis to occur earlier in their loved one's care. They also believed that if done properly, telemedicine communication could be used to establish goals of care and clarify to family members what to expect from a hospitalization. The knowledge that is imparted to participants during the conference may aid not only in understanding treatment plans and allowing for shared decision making but also in communication from the onset; allowing family members to know the treatment team sooner.

“Open communication, early referring to the family...will help manage expectations and set goals.”

“The biggest beneficiaries would be the families of the critically ill; they will, hopefully, have a clearer picture of what to expect”.

“ Huge benefit of establishing rapport with the family in a timely way. Families will undoubtedly be happier if they have realistic expectations prior to transfer.”

“Decrease anxiety with patient/family member by clarifying goals of care with the treating physician. Introduces appropriate care team and allows for smoother transition from one institution to the other”.

### Barriers:

Within the theme of barriers, we identified four subthemes or domains including time, perception, technology, and logistics.

#### 1. Time:

Participants thought that time might be a significant barrier to the use of telemedicine.

They were concerned telemedicine conferences would take a long time to conduct and would be too time consuming to set up and therefore would not be a resource clinicians would readily use.

“A big concern would be scheduling all the participants, timeliness of the conversation.”



“Time, family willingness to “waste time” while conducting conference.”  
“Time; often having everyone available prior to transport I would imagine could be very difficult, especially if the patient is very unstable and transport is needed ASAP.”

Additionally, there was a sense that the timing of the telemedicine conference was problematic from a patient care standpoint. The conference may interrupt the delivery of care to patients already admitted to a TCC and might delay transfer of a seriously ill patient.

“Prolonged conferences with family when additional patients require care could be an issue.”

“Using this technology might be waiting too long to have the conversation.”

“If a patient is crashing, time is important. May delay transport, consume availability of the physician....”

## 2. Negative perceptions of telemedicine

Another key subtheme under the broad theme of barriers was perception. Perception could be subdivided further into perceptions of clinicians and perceptions of families. Respondents believed that using telemedicine might seem like an effort to avoid admissions and that it would have to be presented to referring hospitals as a tool to aid communication, not avoid care.

“Potentially, family or referring MDs may think we do not want to take the patient or we are trying to delay transfer.”

“Team has to be deliberate in identifying goals of care and to not let personal bias enter into a subconscious effort to dissuade family from transferring patient.”

“The impression that (accepting hospital) may not be accepting of receiving the patient, although this was not reflected in the video, it remains an issue. Would need real champions on both ends of the communication lines and both facilities.”

Family perception was also an interesting subtheme. We found that many clinicians who had never used this technology were concerned about the impersonal way technology can be perceived compared to face-to-face conversations.

“...I think it may be more difficult to get a decision over a video feed as this is less personal....”

“Difficulty of creating personalized connection between a physician and a patient.”

“Families could feel like we are pushing them down a ‘comfort’ road prematurely, but in this video that was clearly not the case.”

“The primary concern is that we may lose personality or humanity in the discussion between doctor and family.”

“Families may find it cold and impersonal, absent personal touch using telemedicine.”

“Even with the best people involved, talking through a video set up will always feel less personal than a face-to-face meeting. That said, the world is getting more and more used to communicating this way.”

“It does seem very impersonal in comparison to an in person meeting however. Lack of physicality and presence which might be important with emotional families.”

### 3. Technology:

Another pervasive theme surrounded the concept of technology. There were concerns that the actual telemedicine setup would be too difficult and that its availability might be significantly limited.

“One concern might be in using the equipment. Who sets up the monitor and what do you do if you have a problem, especially at night?”

“Getting access in rural locations seems like a big barrier....”

“You would need to be very familiar with the technology. Availability of the technology is another major issue....”

### 4. Logistics:

Logistical issue related to conducting a multidisciplinary conference was another theme present among almost all participants’ responses. There were concerns about technology and time involved as described earlier, and in addition, specifically to the coordination of people, facilities and supplies.

“I think it will be difficult to get access in rural locations and getting all the MDs there at once.”

“Coordinating schedules to ensure all members can be available.”

“...gathering all the necessary persons in the same place when there is a busy ICU or time is of the essence.”

“...getting all the right parties in the room at one time.”

“Trying to get all disciplines to meet with a family at a convenient time is a difficult task [even] without telemedicine....”

In addition to these themes, lack of reimbursement, delaying transfer, and a lack of education regarding appropriate communication skills using telemedicine were also concerns.

“I think that taking the time to do this would be helpful if time to communicate during these conferences were reimbursed.”

“What if this delays transfer, how do we address that with family members?”

“Since it is so brief and impersonal, we must be careful in conversation to be accurate with information and not lead to inappropriate expectations.”

#### **4.6 Discussion**

This novel investigation provides new data about clinicians’ perceptions of the use of teleconferences for early communication with family members of critically ill patients who have been requested for transfer to a TCC. Previous studies have shown telemedicine can be used effectively to provide clinical care such as diagnosis and management. For example, patients who have used telemedicine for consultative purposes report no difference in satisfaction with these encounters compared to interactions with providers face-to-face.[18, 19] In addition, Collins et al found no difference in satisfaction outcomes when comparing a telemedicine care group with a usual care group.[20] To date, studies of telemedicine have focused on consultations empowering patients with chronic diseases to manage therapies and participate in shared decision-making and have demonstrated increases in patients’ knowledge of disease processes and quality of life.[21, 22]

There are no data, to date, to support that telemedicine used for conducting family conferences can have the same impact on health care service utilization or perceived quality of care by family members. We found that providers believed that families could have increased satisfaction with overall care using telemedicine for family conferences even though it is not being used to provide direct care but to improve communication. Additionally, this study found that providers believed that telemedicine could be used to educate family members and this could benefit decision-making and enhance satisfaction with care, leading to appropriate utilization of services by providing early communication and providing care that aligns with patient wishes.

We also found that some providers believed that telemedicine could help improve quality of communication with a patient's family. Although respondents speculated about what aspects of this process would improve communication, such as clarity and establishing rapport, this concept of improving the quality of communication needs be evaluated in detail. In addition, although some providers thought communication would be enhanced to some extent, many were also concerned about the perception of communication being too impersonal. Data suggest that telemedicine improves communication because it facilitates communication from a distance.[23] However, there are only a few studies that have dealt with the nature and content of communication, such as verbal content analysis during telemedicine consultations.[24, 25] The results of this study suggest that further investigation is needed in this domain, particularly surrounding the experiences of the family members with receiving this form of communication.

Several additional barriers to the use of telemedicine for conducting family conferences were identified including time, negative perceptions by providers and family,

technological issues and logistics. Of interest, not all these are the usual barriers to telemedicine that have been identified in previous studies. In addition to the concern about a perceived loss of personal contact by the physician with family members, there was also concern that clinicians at referring rural hospitals might find this form of communication as a way to dissuade transfer of a patient. This suggests that although communication with family members might be enhanced with telemedicine, an unplanned effect may be conflicting perceptions between tertiary care center physicians and the referring physicians. This interesting barrier needs to be explored further by understanding the experience of clinicians who utilize telemedicine for this purpose. Technological limitations have been identified as a key barrier for decades and will likely remain a barrier until telemedicine is widely accepted and utilized. In addition, regulatory, work force, cultural, licensing and reimbursement issues have been domains identified as significant barriers in the past.[26-28]

Previous research has shown that patients perceive telemedicine to be useful because: 1) they have the opportunity to have their primary physician present while seeking subspecialty service, 2) they have increased social support by receiving care from multiple people simultaneously, and 3) there is decreased travel time and distance to receive care.[18, 19, 29-31] It is unclear if these findings will apply to telemedicine used for early family conferences.

Data suggest that physicians that use telemedicine consultative services are usually satisfied with the process and clinicians that have used telemedicine before are more likely to use telemedicine again. [32] Users also have more positive attitudes regarding telemedicine than do non-users.[9] This is also reflected in our data: there were

significant concerns regarding the logistics and time involved in using telemedicine though only 9% of respondents of this study had used it in the past.

There are limitations of this study. First, the response rate to the questionnaires was 68%, and although this is a better response rate than most questionnaire/survey studies[33] , we still were not able to capture the perceptions of 32% of potential responders. Moreover, there were very few non-physician responses. Despite these limitations, this study is significant in that it identifies new areas in telemedicine that are in need of exploration; Specifically, verbal content analysis of telemedicine interventions and prospective studies using telemedicine for family conferences need to be investigated.

#### **4.7 Conclusions**

Telemedicine has been used for diagnostic, therapeutic and educational purposes in the past. This study describes the perceptions of clinicians using telemedicine to conduct family conferences with family members of critically ill patients. ICU physicians and nurses believe that there may be several benefits to this form of communication including increased satisfaction, improved communication and empowerment of families by dissemination of knowledge. However, they also identified barriers to the use of this intervention in terms of increased and unreimbursed time commitments, problems with the technology, and logistical difficulties. In addition, they expressed concerns that families and referring providers could have negative perceptions of the receiving care team if the receiving care team was perceived to be discouraging transfer for ulterior motives and that the communication might seem impersonal. Additional research is

needed to evaluate the perceptions of families and providers during pilot interventions of telemedicine for the purpose of conducting family conferences.

Table 4.1 Codebook for analyzing survey Results

<b>Theme -subthemes</b>	<b>Description</b>	<b>Examples</b>
<b>Benefit_ Teled</b>	<b>Perceived impact would provide improved outcomes</b>	<b>“I think this service could help us avoid a lot of difficult issues when taking these complicated patients”</b>
<b>-Satisfaction</b>	<b>Statement described an outcome of improved satisfaction with care</b>	<b>“early contact with the family will improve family satisfaction”</b>
<b>-Knowledge</b>	<b>Statement described an outcome related to clinical information regarding the situation</b>	<b>“Families will have a sense of what to expect on transfer, the actual acuity of illness of their loved one”</b>
<b>-Communication</b>	<b>Statement described an outcome related to improving communication and clarification of care plans</b>	<b>“Set up goals for all involved. Improves communication with the primary team and the patients family...”</b>
<b>Barrier_ Teled</b>	<b>Perceived impact or documented concerns deter the use of telemedicine</b>	<b>“...getting access, time, all the parties involved in one room it seems surmountable, but difficult”</b>
<b>-Time</b>	<b>Statement described time as a barrier</b>	<b>“Time- gathering all the necessary persons in the same place when there is a busy ICU or time is of the essence” “Time to gather the team when the patient could have already transferred”</b>
<b>-Perception</b>	<b>Statement described a clinician or family negative perception regarding the purpose of the conference</b>	<b>“Loss of personal feel” “Avoiding a transfer might make the outside hospital feel shut-out”</b>
<b>-Technology</b>	<b>Statement described the use of technology as a barrier</b>	<b>“Familiarity with the telemedicine machines is important, otherwise it would be like calling on a telephone”</b>
<b>-Logistics</b>	<b>Statement described coordination of people, facilities and supplies</b>	<b>...setup and arranging around the availability of family and ICU staff”</b>



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